7. Eastern Strait of Juan de Fuca Conservation Unit

7.1. Introduction

The Eastern Strait of Juan de Fuca Conservation Unit includes the entire Strait of Juan de Fuca summer chum salmon independent population aggregation as designated by the Puget Sound Technical Recovery Team (PSTRT). Estuaries, the lower riverine habitat of presumed summer chum presence, and the watershed processes that contribute to habitat formation in these areas, need primary consideration in the SRP. The main stocks targeted for recovery are those originating from the Salmon/Snow Creek and Jimmycomelately Creek watersheds. Chimacum Creek summer chum are considered as a satellite area extending the main production areas of Jimmycomelately and Salmon/Snow Creeks. Chimacum Creek summer chum salmon were extinct, but a supplementation program utilizing Salmon Creek stock is has been successful in reintroducing summer chum to the watershed. Information on Dungeness River summer chum salmon distribution is not well known. Summer chum have been observed (Washington Department of Fish & Wildlife and Point No Point Treaty Tribes 2003a) and adults have been recovered at the Dungeness Hatchery located at RM 10.8 (WDFW and PNPTT 2000).

WDFW and PNPTT (2000) report that summer chum salmon originating from the Eastern Strait of Juan de Fuca Conservation Unit are likely from the Salmon/Snow Creek and Jimmycomelately watersheds. The highest density of spawners in Salmon Creek is observed at approximately river mile (RM) 0.7 with the full extent of recently observed spawning up to RM 2.0. In Snow Creek the majority of spawning occurs below RM 1.5 with spawning extending up to RM 3.0. The current upper extent of spawning in Jimmycomelately Creek is likely at RM 1.5, but historic spawning may have occurred up to RM 1.9. Spawning in Chimacum Creek likely occurs in the lower river below RM 3.0. Surveys have observed spawning between the mouth and RM 1.0 (WDFW and PNPTT 2003). During 2004 adults were observed up to the Nesses Corners Road at approximately RM 2.0 (Al Latham, personal communication 2005).

Jimmycomelately and Salmon/Snow Creek summer chum salmon stocks are considered the “core” source for the Strait population aggregation. Restoring properly functioning conditions in both the Jimmycomelately and Salmon/Snow Creek watersheds would ensure the persistence and survival of the Strait population aggregation. Chimacum Creek functions as the “satellite” area for the Strait population aggregation. Restoration and maintenance of habitat that can support summer chum salmon in this watershed is critical. Estuarine and marine nearshore areas of Discovery Bay, Sequim Bay and the Eastern Strait of Juan de Fuca provide valuable juvenile rearing and migration habitats as well as production of food resources for juveniles and adults.

May and Peterson (2003) designated RM 0.0-2.0 on Salmon Creek, RM 0.0-6.5 on Snow Creek, and RM 0.0-2.0 on Chimacum Creek as Category B refugia, defined as "primary refugia with altered ecological integrity." Salmon Creek, from the mouth to RM 0.8 is the primary spawning habitat for summer chum salmon. Small pockets of intact, forested riparian and side-channel habitat remain in this segment. Protection of these intact habitats along with restoration of some of the degraded areas is a high priority for Salmon Creek. The primary summer chum spawning habitat is found from RM 0.0 to 1.0 in Snow Creek. Restoration of this potentially productive area is considered a high priority.

Current habitat conditions and situations were assessed using a variety of sources. Several sources were used to assess the summer chum salmon stocks in the Eastern Strait of Juan de Fuca conservation unit. This Salmon Recovery Plan (SRP) will not repeat the details of these assessments, but instead refers the reader to the cited documents. All material and documents referenced in this SRP should be considered part of, and integral to, the recovery of summer chum salmon. These sources provided the primary reference and knowledge base for development of these aspects of the SRP. Details of the EDT assessments for the Eastern Strait of Juan de Fuca stocks, including a summary of the baseline performance measures, and a summary of strategic priorities, are provided in Lestelle et al, (2005a) (see Appendix A). The EDT Method is a widely used tool to help prioritize habitat restoration and protection measures for salmon populations. It provides a systematic way of diagnosing habitat conditions that have contributed to the current state of populations, and it enables an assessment of priorities for developing restoration and protection plans. It also provides an analytical procedure for assessing the potential benefits to salmon populations of actions that might be taken to address habitat related issues impeding recovery. Other detailed assessments of habitat and environmental conditions are provided in the SCSCI (WDFW and PNPTT 2000), Correa (2002), and May and Peterson (2003).

Priority action recommendations developed in this Summer Chum Salmon Recovery Plan (SRP) will focus initially on the lower 1-2 miles of river and estuarine areas. Actions in the upstream areas of the watersheds will require assessments to determine impacts and limiting factors that contribute to degradation in the lower reaches. Protection, restoration and maintenance of the Jimmycomelately and Salmon/Snow Creek watersheds are of paramount importance. In both watersheds, the lower river sections (lower 1-2 miles) and the estuaries are targeted for restoration with several projects already implemented. These areas must be restored and protected to effect and ensure recovery of the Strait population aggregation. Habitat in the Chimacum watershed will need to be restored and maintained primarily through the utilization of engineered actions including stormwater controls and a variety of instream projects as appropriate.

The Jimmycomelately summer chum population shows a high loss in performance both in abundance and productivity when compared to historic levels. Under unfavorable ocean survival conditions the loss of performance is severe. The amount of potential increase in population abundance is greatest through restoration of freshwater reaches in the Jimmycomelately watershed. Within the lower freshwater reaches of Jimmycomelately Creek, habitat diversity, channel stability, and sediment load are seen as the most important factors to restore. For the Jimmycomelately population, full restoration of estuarine-marine waters offers somewhat higher benefits than those benefits associated with the natal subestuary.[32] Restoration of the Sequim Bay (Jimmycomelately Creek empties into the head of Sequim Bay) shore will provide the best way to restore the estuarine-marine waters for the Jimmycomelately population. Within the natal subestuary, several factors are approximately equal in importance for restoration, along with the amount of area available to be used for rearing. Within the estuarine-marine environment, the most important factor for restoration is food, associated with loss of eelgrass, shoreline development, and loss of riparian corridors.

The Salmon-Snow summer chum population shows a high loss in performance compared to historic levels both in abundance and productivity, particularly under unfavorable ocean survival conditions. Potential increase in the Salmon/Snow population abundance is greatest through restoration of freshwater reaches. Full restoration of estuarine-marine waters and the natal subestuary at the mouths of both Salmon and Snow Creeks appears to offer similar levels of benefit. The Snow Creek mainstem (upstream of the subestuary) provides the greatest potential for restoration benefits within the freshwater environment. Freshwater reaches in lower Salmon Creek have the greatest strategic priority for restoration for the Salmon/Snow population (Lestelle et al 2005). Within freshwater, habitat diversity and control of sediment load are seen as the most important factors to restore. Within the natal subestuary, food and habitat diversity appear to be equally important for restoration, along with the amount of area available to be used for rearing. Potential benefits of restoring estuarine-marine areas are diffused over many segments, but the Discovery Bay shore is ranked highest among these areas. Within the estuarine-marine environment, the most important factor for restoration is food, associated with loss of eelgrass, shoreline development, and loss of riparian corridors.

Summer chum salmon in the Dungeness River are infrequently observed and their status is currently unknown. Given the size and historic diversity of the

[32] The term *subestuary* refers to the estuarine portion of a stream beginning at the upper extent of tidal influence and extending downstream to the outer edge of the delta. The *natal subestuary* would be the subestuary on the natal spawning river of a salmon population. Those waters stretching beyond the subestuaries are referred to as the *estuarine-marine* areas (see Appendix B).

watershed, it is likely that summer chum salmon production occurred in the Dungeness River. Extensive work focused on Chinook salmon is underway by the Dungeness River Management Team (DRMT) and others. The DRMT was formed in 1988 to provide a forum to resolve watershed issues. Local citizens and governmental agencies meet monthly to coordinate salmonid recovery, water quality and quantity, and flood management activities in the watershed. DRMT has served as the planning and oversight body for major watershed plans and salmonid recovery activities for the area between Jimmycomelately Creek and Siebert Creeks in east Clallam County. Activities include restoration of the estuarine and delta areas, restoration of the lower river floodplain, and restoration of riparian corridors. It is expected that work being done to provide for the persistence and survival of Chinook salmon will also benefit summer chum salmon.

7.2. Geographic Description and Human Population Distribution

The Eastern Strait of Juan de Fuca Conservation Unit includes the Dungeness River, Jimmycomelately Creek, Salmon Creek, Snow Creek, and Chimacum Creek watersheds. Also included within this unit are the marine nearshore waters stretching from the Chimacum Creek estuary along the western shore of Admiralty Inlet, Discovery Bay, Sequim Bay and ending at the Dungeness River estuary. The marine offshore waters of Admiralty Inlet and the Eastern Strait of Juan de Fuca are also included in this Conservation Unit. The Eastern portion of this unit lies in Jefferson County and includes the City of Port Townsend. The western section is within Clallam County and includes the Jamestown S'Klallam Tribal Reservation. Figure 7.1 provides a generalized map of this Conservation Unit. Major watersheds of particular significance for summer chum salmon recovery planning include; Dungeness River, Jimmycomelately Creek, Salmon Creek, Snow Creek, and Chimacum Creek. The Dungeness River watershed in Clallam County drains 270 square miles and courses for over thirty-two miles before emptying into the Strait of Juan de Fuca. Jimmycomelately Creek encompasses an area of 19 square miles and has a stream length of approximately 20 miles. The Salmon Creek watershed is 19 square miles and flows for 9 miles into Discovery Bay. Snow Creek is approximately 10 miles long and also flows into Discovery Bay near the mouth of Salmon Creek. Chimacum Creek's watershed covers approximately 37 square miles with a combined stream length of 30 miles. More detailed descriptions of each of these watersheds can be found in SCSCI Appendix 3.6 (WDFW and PNPTT 2000), the WRIA 17 habitat limiting factors report (Correa 2002), and the WRIA 17 Watershed Management Plan (WRIA 17 Planning Unit 2003).

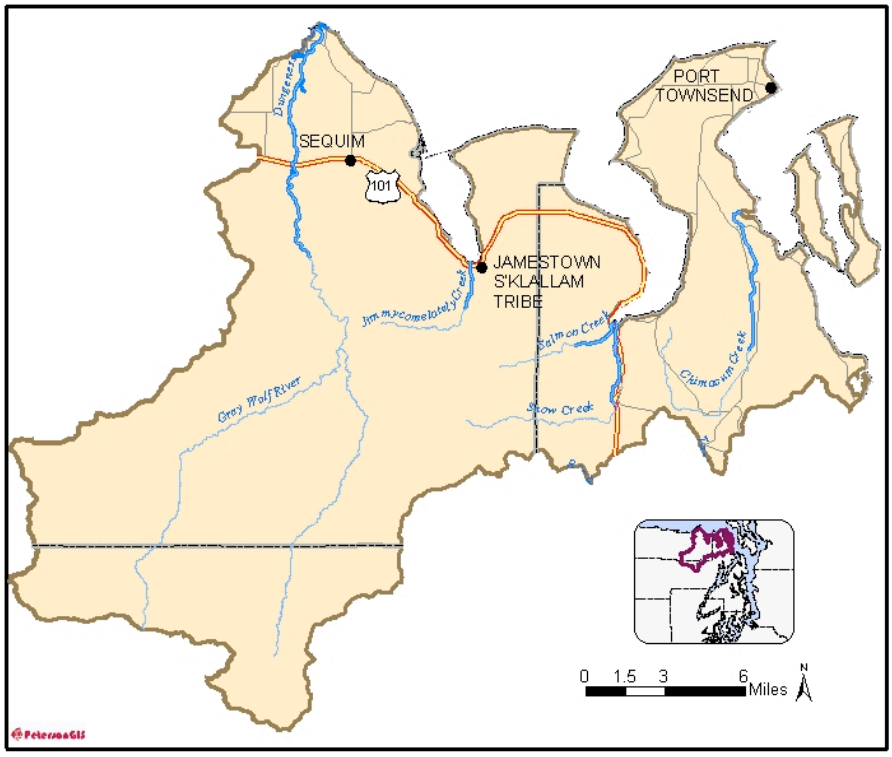

Figure 7.1. Eastern Strait of Juan de Fuca Conservation Unit. Watersheds of significant interest for summer chum salmon recovery are noted.

Human development and population centers are concentrated in the area of the Port Hadlock Urban Growth Area (lower Chimacum Creek), the City of Port Townsend, along the Eastern shore of Sequim Bay and into the Strait of Juan de Fuca and the City of Sequim in the lower Dungeness River watershed. Figure 7.2 shows the human population density within the Conservation Unit.

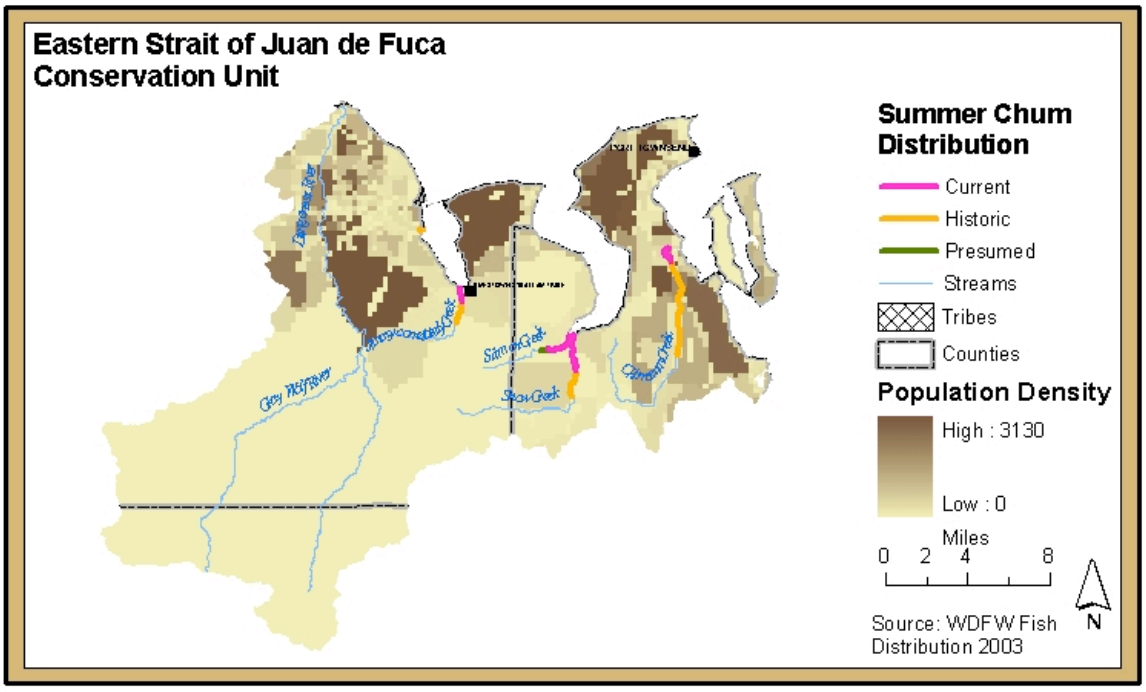

Figure 7.2. Human population density (people per square mile) and summer chum salmon freshwater distribution for the Eastern Strait of Juan de Fuca Conservation Unit.

The highest density of human population, relative to summer chum distribution, is found in lower Chimacum Creek and the lower Dungeness River. Other areas of high human population density include the marine nearshores of the northeast portions of Discovery Bay and Sequim Bay, and the area stretching south from the mouth of Chimacum Creek to Port Ludlow.

7.3. Summer Chum Salmon Stocks' Description and Distribution

The reader is urged to review the Summer Chum Salmon Conservation Initiative (WDFW and PNPTT 2000) and subsequent supplemental reports. Summer chum salmon in Hood Canal and the Eastern Strait of Juan de Fuca were also assessed based on the application of the Ecosystem Diagnostic and Treatment (EDT) Method (see Appendices A and B). The EDT Method is a widely used tool to assist in the prioritization of habitat restoration and protection measures for salmon populations. EDT provides a systematic way of diagnosing habitat conditions that have contributed to the current state of fish populations. It enables an assessment of priorities for developing restoration and protection plans. It also provides an analytical procedure for assessing the potential benefits of actions that might be taken to address salmon habitat problems (Lestelle et al 2005). The complete detailed EDT for summer chum salmon can be found at http://www.wa.gov/hccc/ and click on the Salmon Recovery Planning Activities link. Links to various documents and the EDT web site for summer

chum salmon can be found on that page. The web address for the EDT site: www.mobrand.com/edt/sponsors/show_sponsor.jsp?sponsor_id=11

Information regarding Dungeness River summer chum salmon distribution is not well known. Summer chum have been observed (WDFW and PNPTT 2003) and adults have been recovered at the Dungeness Hatchery located at RM 10.8 (WDFW and PNPTT 2000). At this time the SRP will rely on the on-going Dungeness River watershed recovery efforts for Chinook salmon. Further assessment of the status of summer chum salmon in the Dungeness watershed will be required and recommended for future efforts under this SRP.[33]

[33] More information regarding salmon recovery planning work in the Dungeness River watershed can be found in Crain (2003) and at the Dungeness River Management Team's web site: http://www.olympus.net/community/dungenesswc/index.htm.

7.3.1. Stocks' Status & Trends

Current, historic and presumed summer chum salmon distribution in the Eastern Strait of Juan de Fuca conservation unit is shown in Figure 7.3.

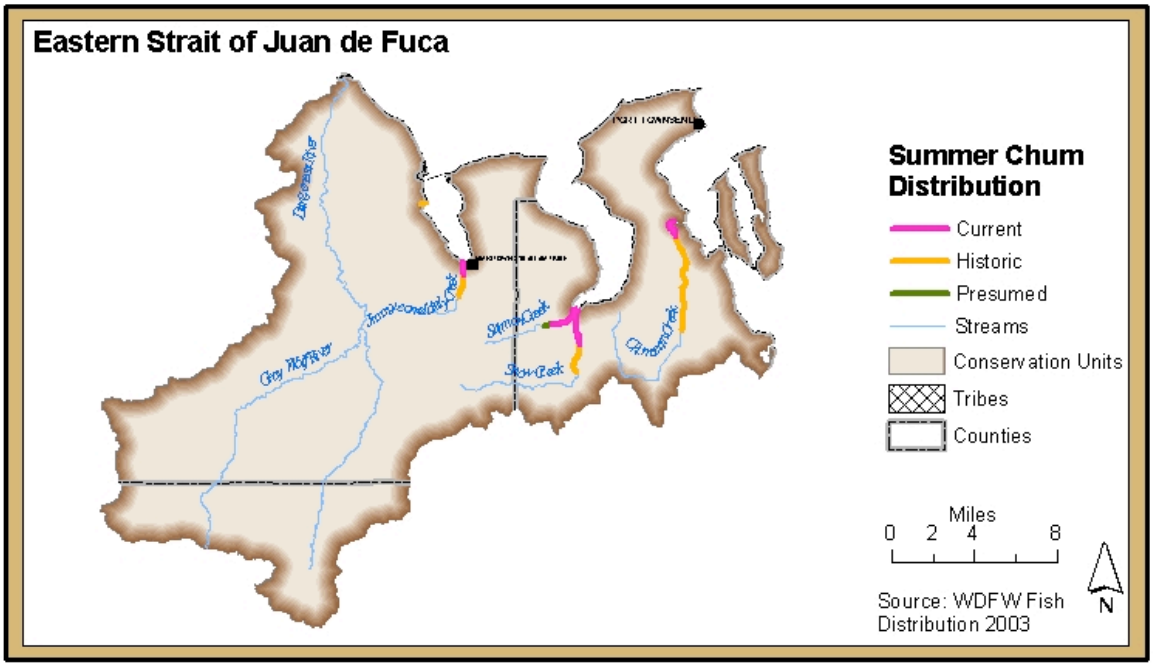

Figure 7.3. Map of the Eastern Strait of Juan de Fuca Conservation Unit showing current historic and presumed summer chum salmon distribution.

All summer chum salmon produced within the Eastern Strait of Juan de Fuca conservation unit comprise one of the two independent summer chum populations tentatively identified by the PSTRT (Currens 2004 Draft in progress). Currens (2004 Draft in progress) provides a detailed analysis of these conclusions. It speculates on the importance of the historical geographic distribution of summer chum salmon habitat and the overall "isolation-by-distance relationship" that seems to be observed in the summer chum salmon aggregations. More analyses of population identification and viability are expected from the PSTRT. At this time it is not expected that these analyses will affect the basic approach taken for recovery in this SRP.

The co-managers (WDFW and PNPTT) have identified two stocks to target for recovery in the Eastern Strait of Juan de Fuca Conservation Unit.[34] These stocks are the natural origin fish spawning in Salmon and Snow Creeks and Jimmycomelately Creek (PNPTT and WDFW 2003). The co-manager interim recovery goals for these stocks are:

[34] The co-managers have also targeted the reintroduction of the Chimacum Creek summer chum salmon as summarized in SRP section 5.

Table 7.1. Strait of Juan de Fuca aggregation: co-manager interim abundance and escapement recovery goals for the Salmon/Snow and Jimmycomelately natural origin spawning aggregations.

Stocks	Abundance	Escapement
Salmon/Snow	1,560	970
Jimmycomelately[35]	520	330

Abundance is defined as the size of the run or the number of recruits. Recruits are the number of fish (in this case summer chum salmon from the Hood Canal/Eastern Strait of Juan de Fuca ESU geographic area) available for all fisheries in any given year. Escapement is defined as the number of adults that return to the natal spawning grounds (they escaped all fisheries and are available to spawn). The co-managers did not provide a combined interim recovery threshold for the Strait of Juan de Fuca summer chum population. Simple addition of the thresholds for the Salmon/Snow and Jimmycomelately stocks provides the following interim thresholds for the combined spawning aggregations[36]:

Table 7.2. Strait of Juan de Fuca aggregation: interim abundance and escapement goals for Strait of Juan de Fuca natural origin summer chum salmon.

Stocks	Abundance	Escapement
Combined Jimmycomelately and Salmon/Snow	2,080	1,300

The interim escapement threshold (target) for the Strait of Juan de Fuca summer chum population is also shown in Figure 7.4.

PNPTT and WDFW (2003) also developed abundance and spawning escapement threshold criteria ro recovery. One of the criteria for recovery is that a summer chum stock (Jimmycomelately or Salmon/Snow) must, over a minimum of the recent twelve year period, have both a mean abundance, and mean escapement, of natural-origin recruits that meets or exceeds the defined thresholds. The following table (Table 7.3) provides a summary of escapement

[35] From Crain (2003): "There is a concern that these interim targets for Jimmycomelately Creek summer chum may represent a moderate risk of extinction using the methods of Allendorf et. al (1997), which specify that a population is at moderate risk of extinction if the total escapement population per generation is less than 2,500 or if the effective population size is less than 500. However, the Allendorf et. al assumptions were theoretical, and a population may be viable at sizes slightly below those the authors predicted. Additionally, these interim targets are based upon observed escapements during the 1970's and early 1980's. It is entirely possible that the population was already in decline by that time, as significant habitat alteration to the creek began in the late 1800's. Finally, it may be that the Jimmycomelately Creek stock is part of a larger population that included the Dungeness River and/or Discovery Bay stocks."

[36] It should be noted that the co-managers interim goals apply to the individual populations and threshold values of combined aggregations do not take precedence over the individual population targets.

for the recent twelve year period, 1993-2004, for the two stocks of concern in the Eastern Strait of Juan de Fuca conservation unit.

Table 7.3. Escapement thresholds for the Salmon/Snow and Jimmycomelately spawning aggregations based on PNPTT and WDFW (2003).

	ESCAPEMENT				
Summer chum population aggregation	**93-04 Average**	**target**	**% of target**	**# times below target 2001-2004 (≤1)**	**# times below target 1997-2004 (≤2)**
TOTAL SJF				0	4
Salmon/Snow	2159	970	223%	0	3
Jimmycomelately	231	330	70%	2	6

The Salmon/Snow summer chum population aggregation currently exceeds the escapement threshold as established by the co-managers. But this population is likely a combination of both hatchery and natural-origin recruits and the target applies only to natural origin recruits. Jimmycomelately, however, falls below the threshold over the recent twelve-year period. The Jimmycomelately Creek supplementation program began with the 1999 brood year, with the first adult returns noted in 2002. The intent of this program is to use 100% of the summer chum salmon returning to Jimmycomelately Creek as the donor broodstock (WDFW and PNPTT 2003).

Additional criteria require that the stocks do not fall below the target more than once in the recent four-year period, and no more than twice in the recent eight-year period. Salmon/Snow meets the criterion for the recent four-year period, but does not meet it for the recent eight-year period. Jimmycomelately does not meet either criterion. Overall, the combined Strait of Juan de Fuca population aggregations do not meet the criterion for the recent eight-year period, but do meet it for the recent four-year period[37]. Finally, it should be noted that the criteria fro productivity (for example, eight year average equal to or greater than 1.6 recruits per spawner) must be met for recovery. Data currently are insufficient to assess the productivity criteria, but are being collected

Summer chum salmon escapement (number of adults returning to spawn) for the Eastern Strait of Juan de Fuca Conservation Unit, from the years 1974-2004 is presented in Figure 7.4. Adult spawning escapement is presented for Salmon

[37] Note that both the four-year and eight-year criteria must be met for recovery. Also, it should be noted that the co-managers did not establish a threshold for the combined population aggregations. This was done by simple addition of the average from Salmon/Snow and Jimmycomelately.

Creek (Figure 7.5), Snow Creek (Figure 7.6), Salmon and Snow Creeks combined (Figure 7.7), and Jimmycomelately Creek (Figure 7.8).

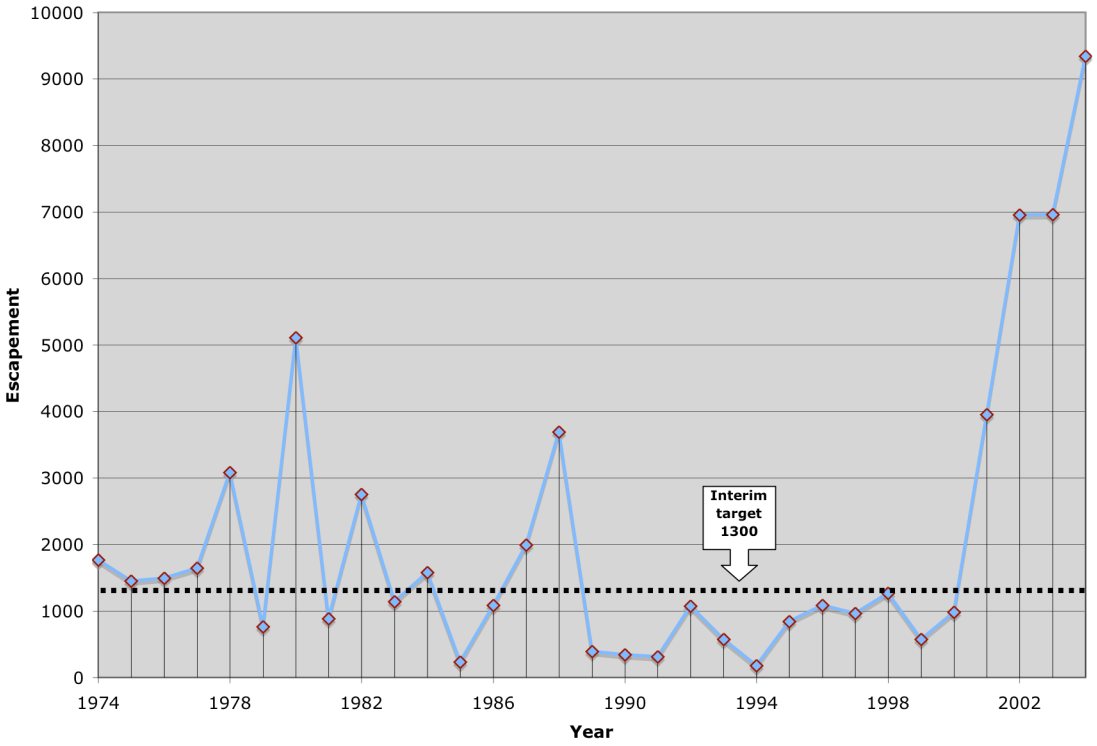

Figure 7.4. 1974-2004 summer chum salmon escapement for the Eastern Strait of Juan de Fuca Conservation Unit. (data source: WDFW and PNPTT 2003, 2004, and 2005)

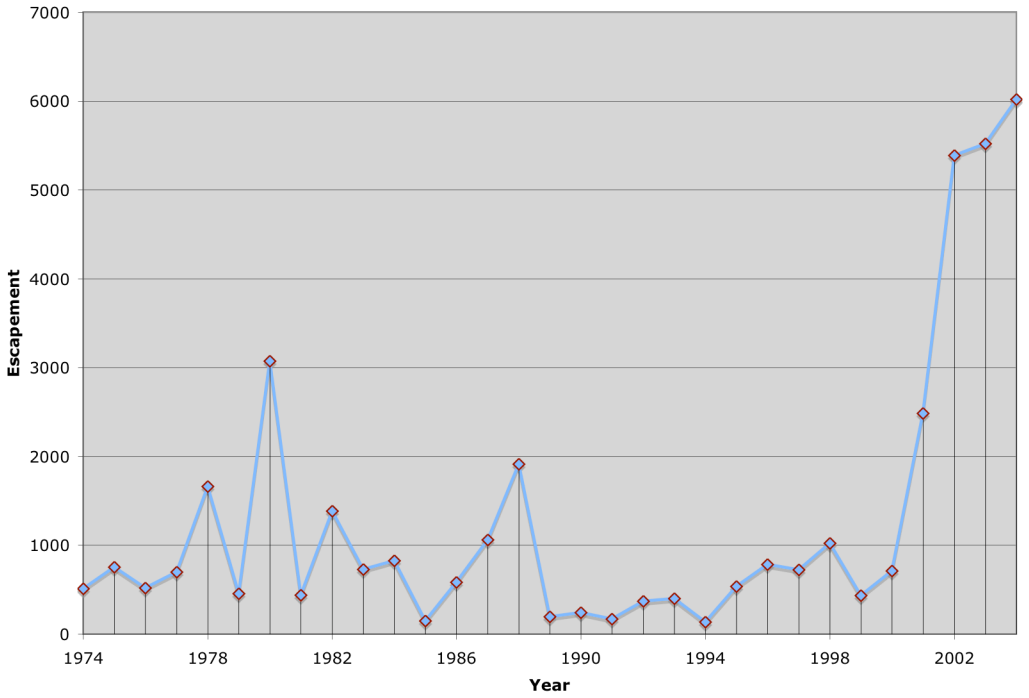

Figure 7.5. 1974-2004 summer chum salmon escapement for Salmon Creek (data source: WDFW and PNPTT 2003, 2004, and 2005).

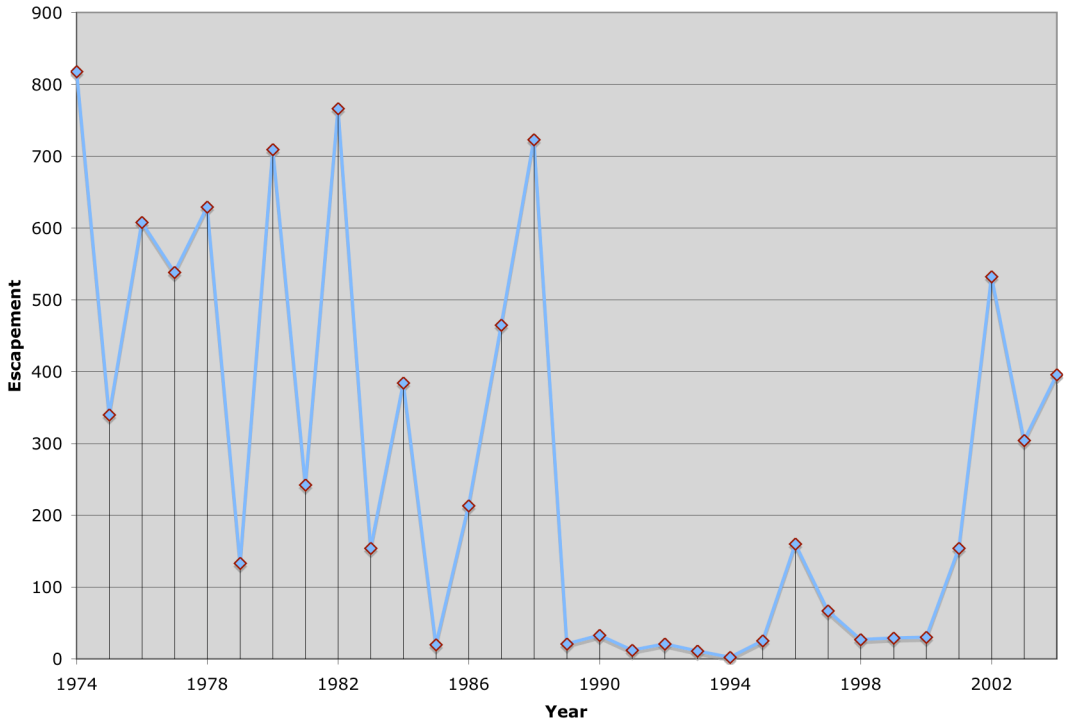

Figure 7.6. 1974-2004 summer chum salmon escapement for Snow Creek (data source: WDFW and PNPTT 2003, 2004, and 2005).

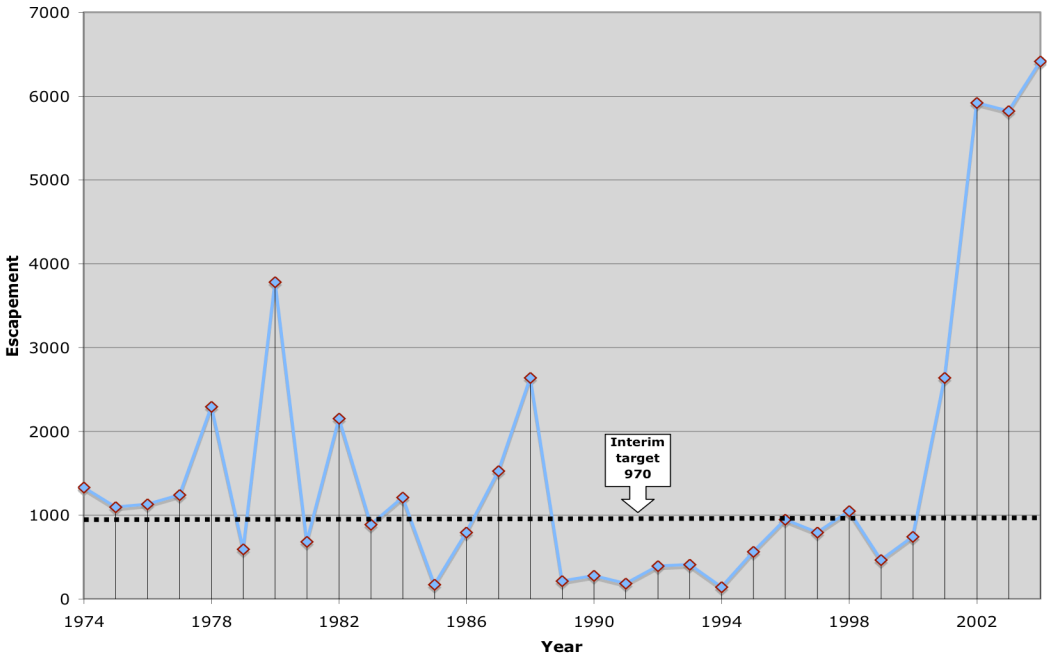

Figure 7.7. 1974-2004 summer chum salmon escapement for combined Salmon and Snow Creek

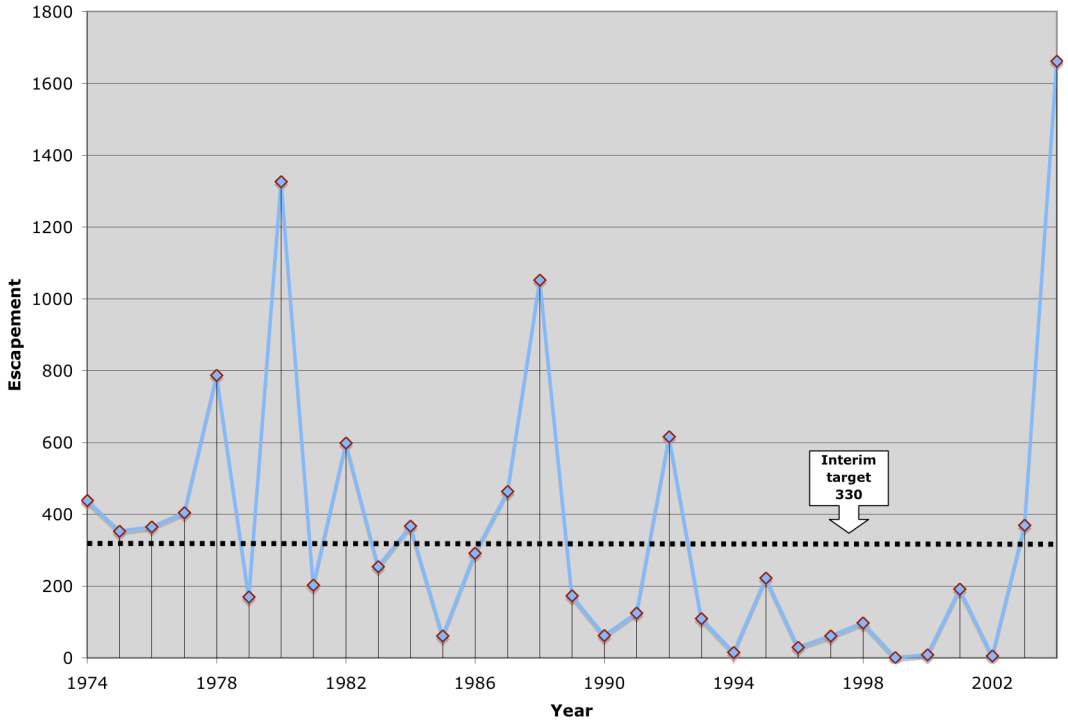

Figure 7.8. 1974-2004 summer chum salmon escapement for Jimmycomelately Creek (data source: WDFW and PNPTT 2003, 2004, and 2005).

The co-managers have assessed the extinction risk faced by individual summer chum salmon stocks, based on the methodology offered by Allendorf et al. (1997), and discussed it in detail in section 1.7.4 of the SCSCI (WDFW and PNPTT 2000). The extinction risk was assessed again in 2003 based on data available through 2002 (WDFW and PNPTT 2003).

A more recent assessment of extinction risk from the co-managers for the Jimmycomelately stock is found in WDFW and PNPTT 2003. It states that: "Escapements for Jimmycomelately Creek for the past four years annually averaged 91 spawners (range of 7 to 260). The effective population size (N_e) equals 66 fish for the 1999-02 return years, and total population size (N) is 328 for the same years. Because of the precipitous decline of this stock and population sizes meeting the high risk criteria (N_e < 500 or N < 2,500), the risk of extinction is judged to be high."[38]

A recent assessment of extinction risk from the co-managers for the Salmon/Snow stock also comes from WDFW and PNPTT 2003 and says that:

[38] It should be noted that, as of this writing, the co-managers' extinction rate assessment for Jimmycomelately has changed in a just updated assessment that includes the years 2003 and 2004. The update indicates the risk of extinction to now be moderate, owing primarily to the high escapements in 2003 and 2004 (WDFW and PNPTT In preparation).

"From 1999 through 2002, escapement estimates averaged 2,375 spawners (range of 528 to 6,049) for the Snow/Salmon stock. The effective population size (Ne) equals 1,710 fish for the 1999-02 return years, and total population size (N) is 8,550 for the same years. The recent return estimates were affected by returns to the existing supplementation project begun on Salmon Creek in 1992. Since the stock (with two streams combined) has experienced increasing overall escapements in recent years and average escapement exceeds the population size risk criteria, the current risk of extinction is judged to be low."[39]

A supplementation program was established for Chimacum Creek to reintroduce summer chum salmon. This was done using stock from the Salmon/Snow Creek system. A supplementation program for the Salmon Creek stock began in 1992 with the objective of rebuilding and stabilizing the natural population and to allow for a transfer of surplus eggs or fry to reintroduce summer chum to Chimacum Creek. Chimacum Creek summer chum salmon are considered extinct as the last documented observations occurred in the mid-1980's. Historic distribution of summer chum salmon in Chimacum Creek is documented (WDFW and PNPTT 2000). Returns to Chimacum Creek from the supplementation program, which was started in 1996, began in 1999 (WDFW and PNPTT 2003). Figure 7.9 provides adult spawning escapement for Chimacum Creek for the years 1999-2004.

[39] A just completed 2005 update of the extinction risk (including years 2003 and 2004) shows no change from the low risk rating for the Salmon/Snow stock (WDFW and PNPTT In preparation).

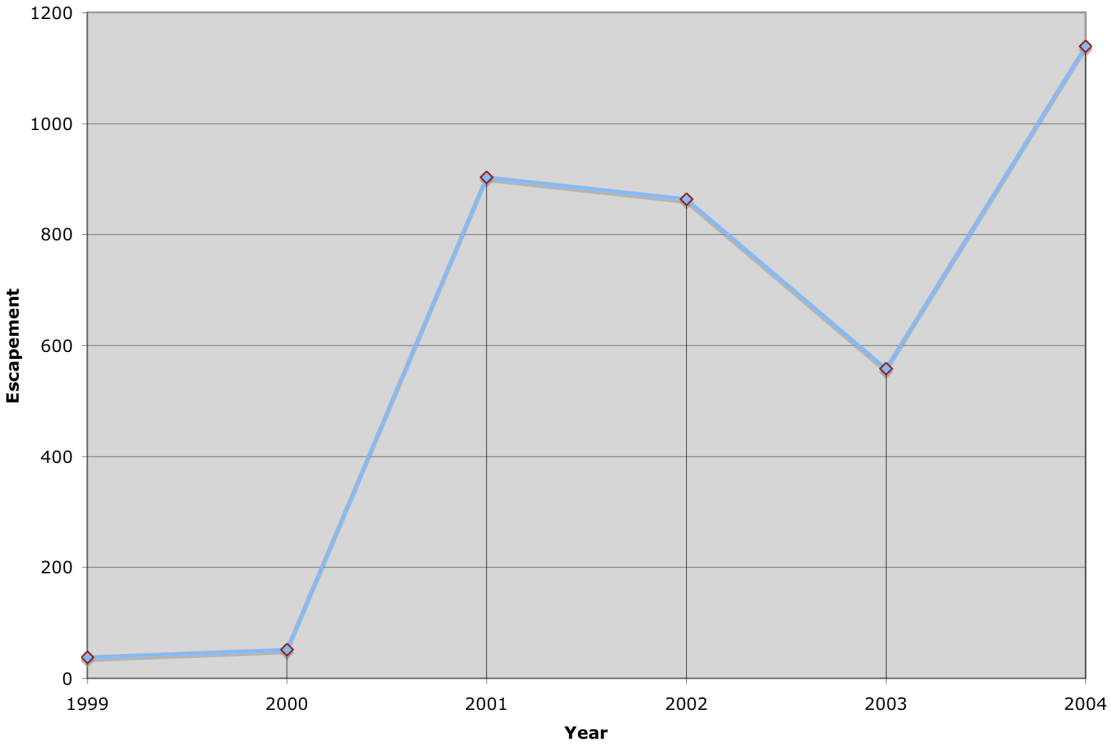

Figure 7.9. 1999-2004 summer chum salmon escapement for Chimacum Creek (data source: WDFW and PNPTT 2003, Adicks et al 2004 and 2005).

7.4. Habitat Overview and Environmental Conditions

7.4.1. Factors contributing to the decline of summer chum salmon

7.4.1.1. Jimmycomelately

The Jimmycomelately summer chum population shows a severe loss in performance, particularly in productivity. Under sustained, unfavorable ocean conditions, the population would be at a high risk of extinction (Lestelle et al, 2005a).

A summary of the EDT Conclusions for Jimmycomelately (from Lestelle et al, 2005a) suggests that:

- The Jimmycomelately population shows a high loss in performance compared to historic levels both in abundance and productivity, particularly under unfavorable ocean survival conditions.
- The amount of potential increase in population abundance is greatest through restoration of freshwater reaches; full restoration of estuarine-marine waters offers somewhat higher benefits than those associated with the natal subestuary.
- Protection of freshwater reaches is the highest priority.
- Potential benefits of restoring estuarine-marine areas are greatest by restoring the Sequim Bay shore.
- Within freshwater, habitat diversity, channel stability, and sediment load are seen as the most important factors to restore.
- Within the natal subestuary, the amount of area available to be used for rearing is important.
- Within the estuarine-marine environment, the most important factor for restoration is food, associated with loss of eelgrass, shoreline development, and loss of riparian corridors.

7.4.1.2. Salmon/Snow

According to the EDT assessment (Appendix A), the Salmon-Snow population shows a severe loss in performance, particularly in productivity. Under sustained, unfavorable ocean conditions, the population would be severely depressed and approaching a high-risk condition.

A summary of the EDT Conclusions for Salmon-Snow (from Lestelle et al 2005a) states that:

- The Salmon-Snow population shows a high loss in performance compared to historic levels both in abundance and productivity, particularly under unfavorable ocean survival conditions.

- The amount of potential increase in population abundance is greatest through restoration of freshwater reaches; full restoration of estuarine-marine waters and the natal subestuary appears to offer similar levels of benefit. Snow Creek mainstem (upstream of subestuary) provides the greatest potential for restoration benefits within the freshwater environment.
- Protection of freshwater reaches shows the highest priority with Salmon Creek having the greatest strategic priority.
- Potential benefits of restoring estuarine-marine areas are diffused over many segments but the Discovery Bay shore is ranked highest among these areas.
- Within freshwater, habitat diversity and sediment load are seen as the most important factors to restore.
- Within the natal subestuary, food and habitat diversity appear to be equally important for restoration, along with the amount of area available to be used for rearing.
- Within the estuarine-marine environment, the most important factor for restoration is food, associated with loss of eelgrass, shoreline development, and loss of riparian corridors.

The SCSCI (WDFW and PNPTT 2000), the "Limiting Factors Report for WRIA 17" prepared by the Washington Conservation Commission (Correa 2002), and May and Peterson (2003) provide details of the various habitat factors and environmental conditions affecting summer chum salmon in this conservation unit. In general, the findings from these reports are corroborated by the EDT assessment (Appendix A). These factors and conditions are summarized in the tables below for Jimmycomelately (Table 7.4), Salmon (Table 7.5), Snow (Table 7.6), and Chimacum Creeks (Table 7.7).

Table 7.4. Jimmycomelately Creek

Factors for decline	Life stage most affected	Remarks
Loss of channel complexity (LWD, channel condition, loss of side channel, channel instability)	Spawning and incubation	In lower reaches, riparian buffers have been reduced or eliminated, stable log jams are scarce, side channels and associated wetlands have been eliminated or cut-off from main channel, loss of LWD, bank hardening, aggradation, increased peak flows, increased bed scour
Sediment aggradation	Spawning, incubation, and adult migration	Rerouting of channel in lower reaches, loss of stream channel complexity, decrease in tidal energy, increased sedimentation, increased redd scour
Degraded riparian condition	Spawning and incubation	Degradation and loss of riparian habitat from mature forested area to a

		present day riparian mixture of young forest (34%), agriculture (12%), roads and dikes (9%), and residential land use (7%)
Estuarine habitat loss and degradation (diking, filling, log storage, road causeways)	Juvenile rearing and migration	Delta area impacted by diking and intertidal fills associated with residential and commercial development along the Highway 101 corridor and railroad grade

Table 7.5. Salmon Creek

Factors for decline	Life stage most affected	Remarks
Loss of channel complexity (LWD, channel condition, loss of side channel, channel instability)	Spawning and incubation	Reduction of riparian buffers, LWD, side channels and associated wetlands
Increase in peak flows	Incubation	Reduction in LWD, and bank hardening, has exacerbated scour events during peak flows, confinement of channel has reduced side channels and wetlands
Degraded riparian condition	Spawning and incubation	Degradation and loss of riparian habitat, from mature forested area, to a present day riparian mixture of young forest (32%), agriculture (43%), low number of pools, forested buffer in lower reach is less than 66 feet in width
Estuarine habitat loss and degradation (diking and road causeways)	Juvenile rearing and migration	Delta area impacted by diking and intertidal fills associated with the Highway 101 corridor and railroad grade, ten roads or causeways cross or encompass the delta
Increased sedimentation (fines, aggradation)	Spawning and incubation	Fines present a moderate impact, but source of sedimentation is unclear

Table 7.6. Snow Creek

Factors for decline	Life stage most affected	Remarks
Loss of channel complexity (LWD, channel condition, loss of side channel, channel instability)	Spawning and incubation	Reduction of riparian buffers, LWD, side channels and associated wetlands, scarcity of pool habitat
Increased peak flow and low summer flows	Spawning and incubation	Extensive re-routing of Snow Creek out of Salmon Creek and Andrews Creek into Snow Creek and channelization have contributed to excessive sediment aggradation, increased peak flows contribute to bed and redd scour
Degraded riparian condition	Spawning and incubation	Degradation and loss of riparian habitat, from mature forested area, to a present day riparian mixture of young forest (64%), agriculture (43%), low number of pools, 76% of forested buffer in lower reach is less than 66 feet in width with 56% of that either absent or small immature trees
Estuarine habitat loss and degradation (diking and road causeways)	Juvenile rearing and migration	Delta area impacted by diking and intertidal fills associated with the Highway 101 corridor and railroad grade, two roads or causeways cross or encompass the delta, railroad grade located in center of emergent marsh rearing habitat, railroad grade mutes tidal circulation
Increased sedimentation (fines, aggradation)	Spawning and incubation	Re-routing of channel and loss of in-stream complexity have decreased channel's ability to route sediment through the system, increased aggradation which has increased scour, low flows as a result of aggradation may be impacting access to spawning areas

Table 7.7. Chimacum Creek

Factors for decline	Life stage most affected	Remarks
Increased fine sediments	Incubation	In-stream habitat has been severely degraded by a combination of upstream impacts. Siltation from de-forested and channelized stream segments has degraded spawning gravel conditions.
Increased peak flow, freshwater wetland loss, and channel instability	Incubation	Historic conversion of the lowland valleys from beaver pond wetlands and forested bogs to pasturelands may increase the duration and magnitude of peak flows. Areas around Chimacum, Port Hadlock, and Irondale are urbanizing, with an expected increase to the severity of winter floods from impervious surfaces.
Low flows	Spawning	Water withdrawal for irrigation and loss of wetlands in the Chimacum valley
Estuarine habitat loss	Juvenile rearing and migration	Tidal marshland fill of approximately 30 acres with road crossing

7.4.2. Human development and land use

Human population density in the Jimmycomelately Creek watershed is relatively low with the highest densities (34 persons per square mile) residing near the mouth and lower creek reaches in proximity to known summer chum salmon distribution. Figure 7.9 provides a map showing human population density throughout the watershed.

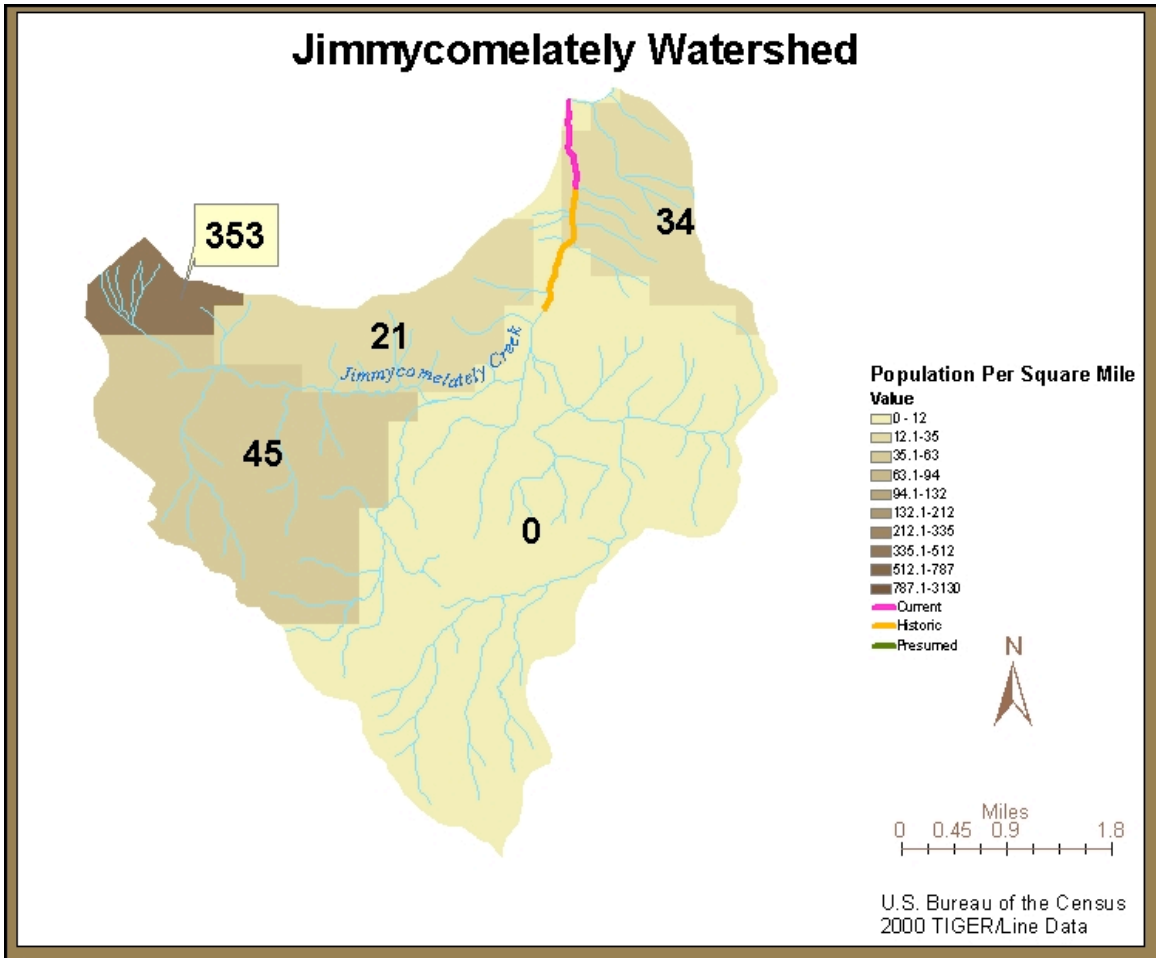

Figure 7.9. Human population density for the Jimmycomelately Creek watershed.

The lower portion (~RM 0.0-0.5) of the Jimmycomelately watershed is zoned as Rural Center (CEN) by Clallam County Zoning Code Title 33 code 33.15.040. Beyond that, Jimmycomelately flows through an area zoned as Rural Very Low. The purpose of Rural Very Low (R20) is “to conserve and enhance the forest resources of Clallam County by providing a transition between rural land uses and Commercial Forest zoning districts” (Clallam County Code 33.10.010). The upper reaches of Jimmycomelately Creek flow out of the Olympic National Forest

and State lands. Figure 7.10 provides a map modified from the Clallam County Parcel and Critical Areas Map (accessed April 30, 2005 at http://www.clallam.net/aimsxwebsite/CA_public_htmlcust/viewer.htm)

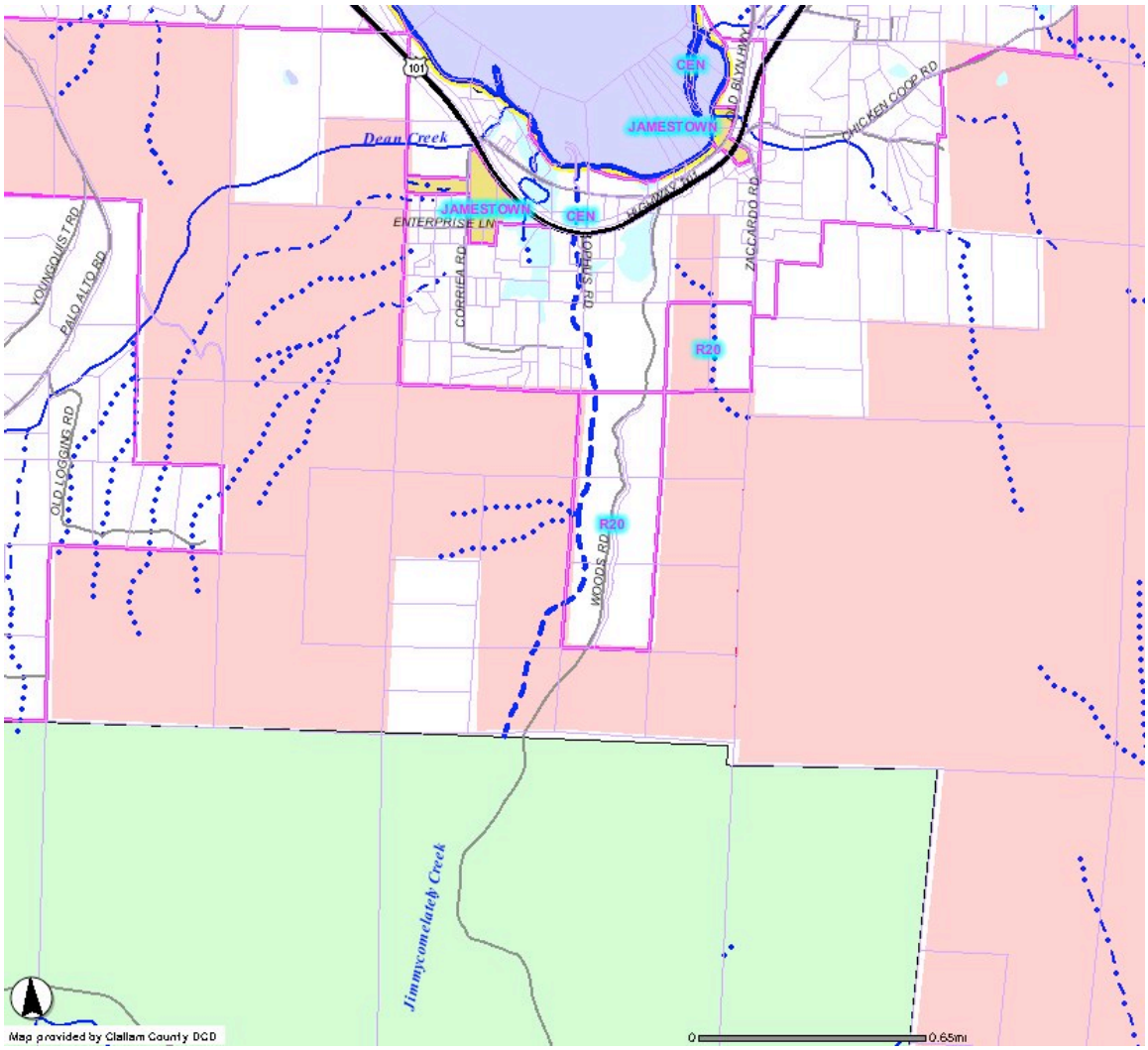

Figure 7.10. The lower Jimmycomelately Creek watershed showing zoning. R20 is Rural Very Low (Clallam Code 33.10.010) and CEN is Rural Center (Clallam County Code 33.15.045). State lands are noted in pink and Olympic National Forest lands are in green. (modified April 30, 2005 from: http://www.clallam.net/aimsxwebsite/CA_public_htmlcust/viewer.htm)

Figure 7.11 presents the zoning for the entire Jimmycomelately watershed.

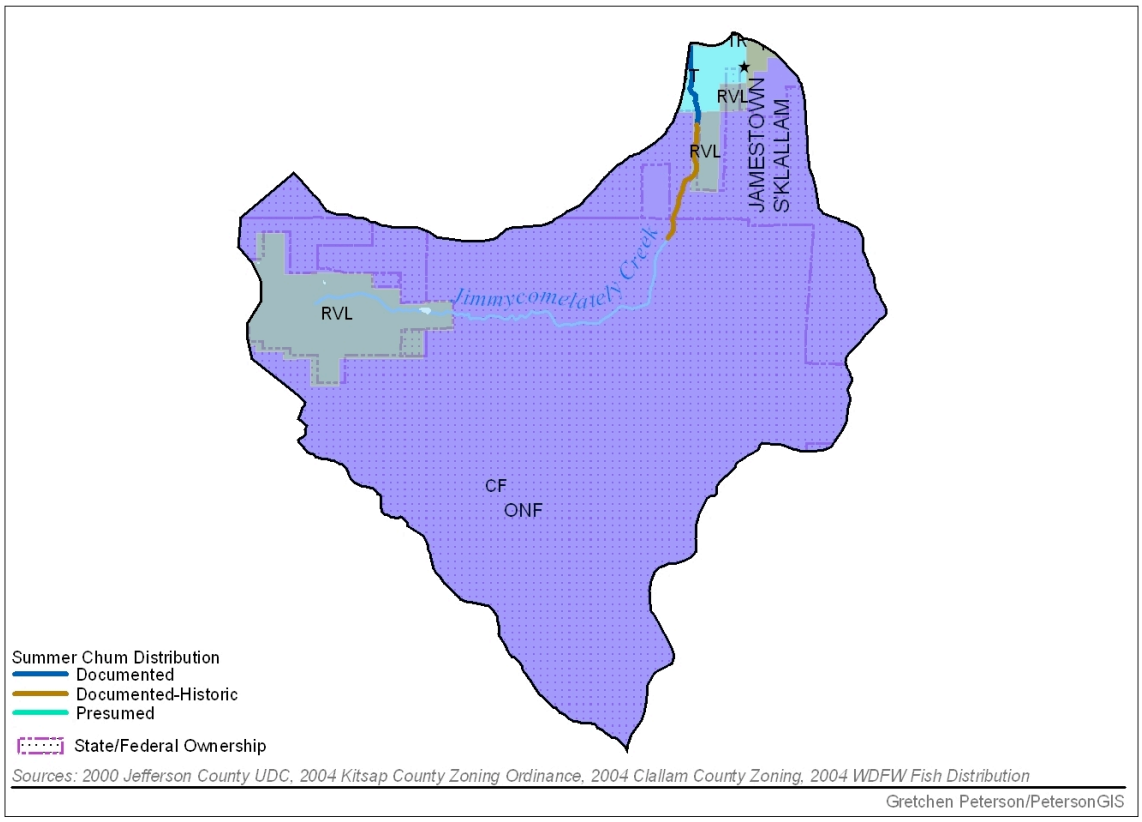

Figure 7.11. Clallam County zoning/land use for the Jimmycomelately watershed. RVL is Rural Very Low, CF is Commercial Forest. CT is the Rural Center.

Human population in both the Salmon and Snow Creek watersheds is low (under 150 total population in each watershed) and is expected to stay that way over the next 20 years (Christensen 2003). Chimacum Creek, however, flows through the Hadlock UGA with a population that is expected to almost double over the next 20 years from 4,669 to 8,674 (Christensen 2003). Table 7.8 presents a summary of current projected population growth in the Salmon, Snow and Chimacum Creek watersheds.

Table 7.8. Human population projections and growth rates for the Salmon Creek, Snow Creek and Chimacum Creek watersheds from (Christensen 2003).

Watershed	Human Population in 2000	20 Year Estimated Human Population Growth	2024 Estimated Human Population	Notes
Salmon Creek	118	23	141	Rural Growth Rate assumed 1.09%
Snow Creek	68	13	81	Rural Growth Rate assumed 1.09%
Chimacum Creek	4,669	4,005	8,674	Based on UGA population growth rate of 2.76% and rural growth rate of 1.09%*

*Note: Population projections are based on Resolution of Jefferson Board of County Commissioners and City of Port Townsend and analysis of trends in population growth (Memo dated April 16, 2003 from Cascadia Planning)

Human population density in the Salmon/Snow Creek watersheds is depicted in Figure 7.12. Densities are relatively low in the proximity of summer chum distribution with the highest being in the lower sections near the mouth and along the marine nearshore adjacent to the estuary.

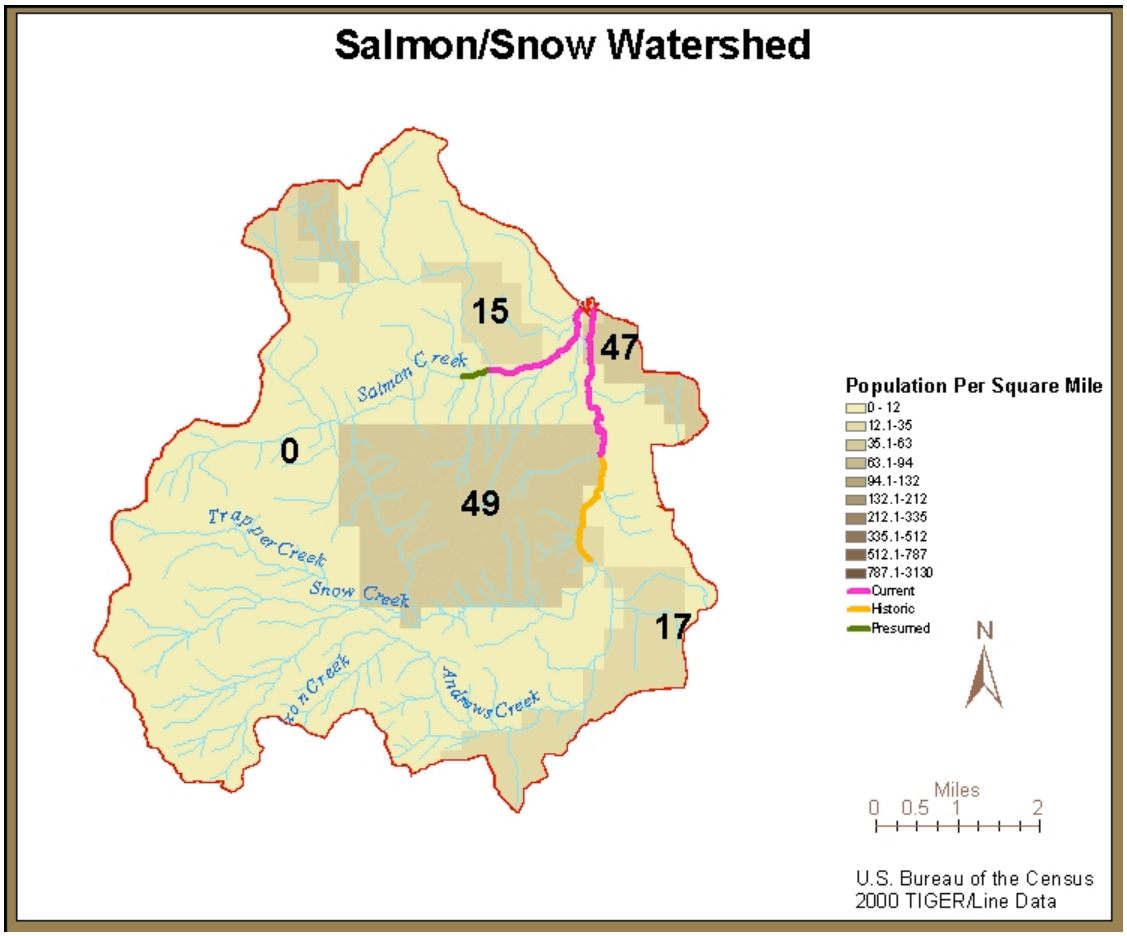

Figure 7.12. Human population density for the Salmon/Snow Creek watersheds (map produced by Gretchen Peterson, PetersonGIS).

Jefferson County zoning for the Salmon/Snow Creek watersheds are presented in Figure 13.

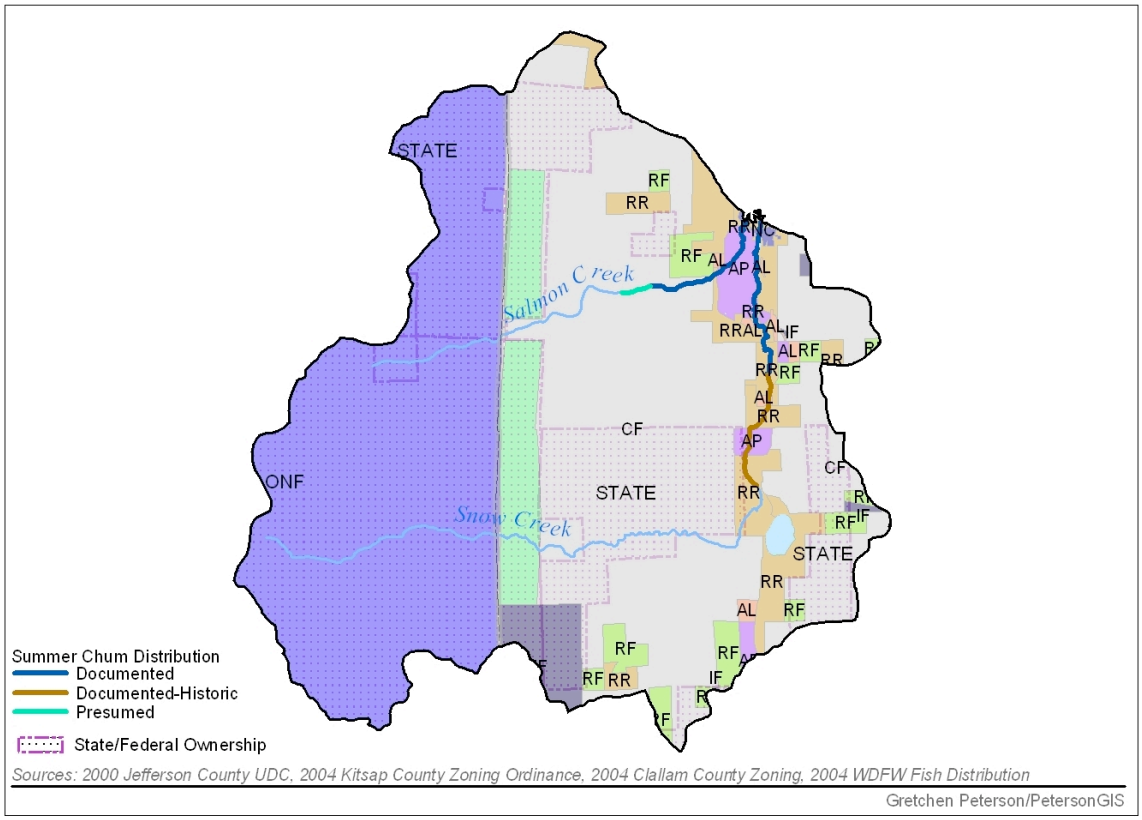

Figure 13. Jefferson County zoning for the Salmon/Snow Creek watersheds. RR is Rural residential, RF is Rural Forest, AL and AP are Agricultural Lands, CF is Commercial Forest. Map also depicts Federal and State ownership

Christensen (2003) reports that the lower reaches of Chimacum Creek lie within the Tri-Area Urban Growth Area. Based on the latest census information, the human population growth rate is estimated at 2.76% within the Tri-Area Urban Growth Area. Based on current development patterns, the Hadlock Urban Growth Area (Hadlock UGA) is one area where future development may conflict with summer chum recovery.

The extent of the Hadlock UGA is shown in Figure 7.14. Although the Hadlock UGA is considered within the Chimacum Creek watershed, only a portion of the land area actually drains toward Chimacum Creek. Instead, most of the area within the Hadlock UGA directly infiltrates into the excessively coarse soils, and drains directly to marine waters. Other areas of the UGA have formal stormwater collection, which also bypasses Chimacum Creek, draining into marine waters. Gray and Osborne are conducting a more detailed subwatershed-scale analysis as a part of the Tri-Area Stormwater Plan (Christensen 2003).

The summer chum spawning reach is generally below the Irondale Road Bridge, which is outside of the proposed UGA. However, the spawning reach is also downstream of the proposed UGA, so upstream hydrologic and water quality impacts originating in the UGA potentially could affect the spawning reach.

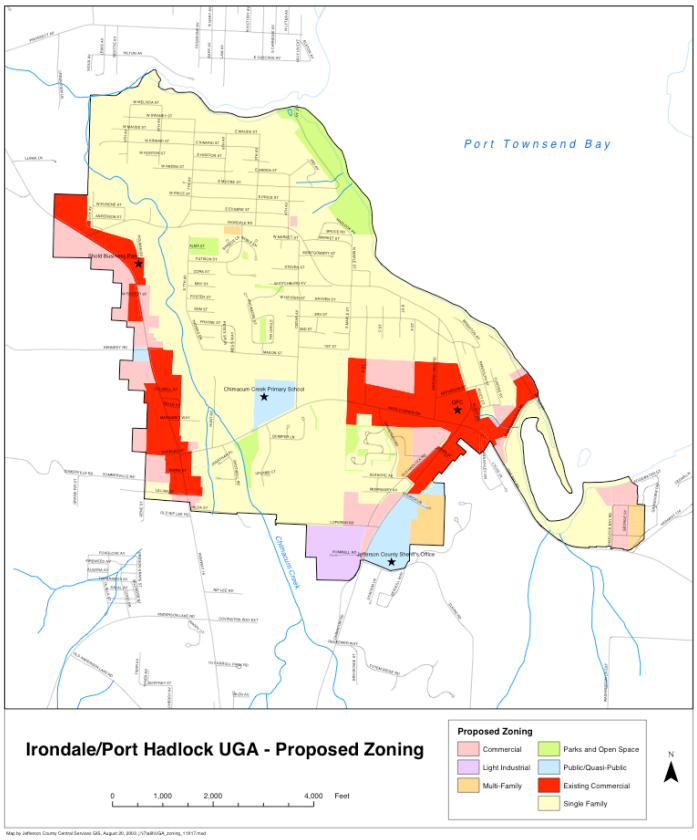

Figure 7.14. Irondale/Port Hadlock UGA.

Understanding future population growth, and its associated development, is critical to determine the potential future impacts to summer chum salmon habitat. A build-out analysis was conducted for the summer chum salmon ESU geographic area. This analysis used impervious surface area as a proxy for development. Based on existing land use designations (which are unique to each individual County), future impervious surface area was calculated and modeled. The amount of additional impervious surface area (relative to current) and where it can be expected to occur was determined for each County. Appendix C provides details of the methods used to conduct these build-out analyses.

Build-out was analyzed for the Jimmycomelately watershed in Clallam County and the Salmon, Snow, and Chimacum Creek watersheds in Jefferson County

(Appendix C). Riparian corridors were determined to be 200 feet on each side of the stream up to the point of presumed distribution of summer chum salmon. Impervious surface area (IP) was measured using 5-meter resolution satellite imagery (Peterson 2005). Current IP within this corridor on Jimmycomelately Creek is 2.1% of the total riparian area corridor. For Salmon Creek the current IP is 3.5% and for Snow Creek the current IP is 7.7%. Build-out IP looked at the potential to develop the land under current regulatory programs and land use codes for the respective Counties. Build-out IP for the Jimmycomelately riparian corridor examined is expected to be at 8.5%. Build-out in the Salmon Creek riparian corridor is modeled to be increased to only 3.6% of the total from a current IP of 3.5%, adding 0.1 acres of IP to the corridor. Build-out in the Snow Creek corridor is modeled to increase by 4.4 acres in the corridor to a value of 10.2% of the total corridor area. These results are summarized in the table below.

Table 7.9. Current impervious area and modeled build-out for the riparian corridors of the Eastern Strait of Juan de Fuca Conservation Unit.

Riparian Corridor	Corridor area acres	Current IP acres	Build-out IP acres	Added IP acres	Current IP%	Build-out IP%
Jimmycomelately Creek	97	2.1	8.2	6.1	2.1	8.5
Salmon Creek	100	3.5	3.6	0.1	3.5	3.6
Snow Creek	177	13.7	18.1	4.4	7.7	10.2

The uplands and nearshore within one mile of the Jimmycomelately and Salmon/Snow Creek subestuaries were also analyzed for projected build-out (Appendix C). Of the total area delineated in the subestuary zones, current IP for Jimmycomelately is 3.0% and for the Salmon/Snow estuary it is 2.1%. After build-out, the percent of the subestuary area analyzed for Jimmycomelately is estimated to be 8.6% and for Salmon/Snow 4.0%. These results are summarized in Table 7.10.

Table 7.10. Current impervious area and modeled build-out for the subestuaries of the Eastern Strait of Juan de Fuca Conservation Unit.

Estuary	Current IP%	Build-out IP%
Jimmycomelately	3.0	8.6
Salmon/Snow	2.1	4.0

Watershed and stream research, which typically looks at a watershed-wide perspective, generally indicates that certain zones of stream quality exist. Most notably, at about 10% impervious cover area, sensitive stream elements are lost from the system. A second threshold appears to exist at around 25 to 30%

impervious area, where most indicators of stream quality consistently shift to a poor condition (e.g., diminished aquatic diversity, water quality, and habitat scores).[40] More research is needed to determine if this research directly applies to the present analysis. It should be noted that similar research, however, has not been conducted for estuary and subestuary areas.

7.5. Specific Action Recommendations

This section presents specific recovery action recommendations for the Eastern Strait of Juan de Fuca conservation unit. Recommended actions are categorized as either Programmatic (section 7.5.1) or Project (section 7.5.2). Actions identified will be further delineated as actions to benefit the targeted spawning aggregation (in the case of the Eastern Strait of Juan de Fuca conservation unit, either the Jimmycomelately or Salmon/Snow aggregations). These specific action recommendations are also summarized and analyzed in the context of overall ESU-wide recovery (see section 13). All actions (previously implemented, on-going, and proposed) will become part of the Monitoring and Adaptive Management Program for the SRP as described in section 14.

7.5.1. Programmatic Actions

Programmatic recovery actions are those that are part of a policy, program, or process. They are generally of a regulatory or planning process nature. Programmatic actions could be part of a County's land use and regulatory program and structures, or watershed planning processes. Comprehensive plans, critical areas ordinances, shoreline management master programs, and zoning could all be considered programmatic actions in this context. Programmatic actions are non-project (i.e., habitat restoration projects--LWD placement, culvert repairs, etc.) in nature. Programmatic actions, however, can include projects when such projects are descriptive of a comprehensive or encompassing process (i.e., levee removal or set back as part of an estuary restoration plan). Watershed management plans often include projects to address identified factors of decline or specific habitat conditions. For the purposes of this SRP, the management plans or planning processes will be considered programmatic actions whereas the projects identified within the management plans will be categorized as projects.

[40] See The Center for Watershed Protection's (http://www.cwp.org) Stormwater Manager Resource Center at http://www.stormwatercenter.net for more extensive references on this subject. Table 1 at http://www.stormwatercenter.net/monitoring and assessment/imp cover/impercovr model.htm reviews the key findings of recent research regarding the impacts of urbanization on aquatic systems.

7.5.1.1. Jimmycomelately Spawning Aggregation

To most effectively address those factors that are likely affecting the performance of the Jimmycomelately spawning aggregation, the SRP recommends the following programmatic actions summarized in Table 7.11.

Table 7.11. SRP recommended programmatic actions for the Jimmycomelately spawning aggregation.

Recommended Programmatic Actions	Actions involved	Limiting factors to address
Jimmycomelately Creek-Lower Sequim Bay Estuary Restoration Project	-support the work in-progress and completion, assist in seeking more funding as appropriate, project can be used as template/example for other similar approaches recommended throughout the ESU (for a summary of this project see the brochure "The 'Undevelopment' of Jimmycomelately Creek and Estuary" written by Linda Newberry and produced by the Jamestown S'Klallam Tribe 2003)	-estuarine habitat loss and degradation -riparian condition -channel complexity
Clallam County zoning for the Jimmycomelately watershed	-support continuation of the present zoning for the upper watershed of Rural Very Low (R20) -monitor long-term effectiveness of the zoning code and enforcement	-riparian condition -sediment aggradation
Olympic National Forest and State lands	-continue to preserve these lands in current ownership -Forest Service road maintenance and road abandonment plans should be implemented including appropriate resources to effectively complete the projects	-sediment aggradation
Community Nearshore Restoration Program	-pursue application and implementation of a Community Nearshore Restoration program for Sequim Bay similar to that being conducted in south Hood Canal (see section 13)	-Estuarine and nearshore habitat loss and degradation
Jimmycomelately Creek Summer Chum Salmon Supplementation Project	-continue the supplementation project to fruition (through 2011) including monitoring	-see WDFW and PNPTT (2000) and (2003a) for complete details of this project, also section 5 of this SRP

7.5.1.2. Salmon/Snow Spawning Aggregation

To most effectively address those factors that are likely affecting the performance of the Salmon/Snow spawning aggregation the SRP recommends the following programmatic actions summarized in Table 7.12. Details of the programmatic actions approved and those being considered by the Jefferson County Board of County Commissioners can be found in section 13.

Table 7.12. SRP recommended programmatic actions for the Salmon/Snow spawning aggregation.

Recommended Programmatic Actions	Actions involved	Limiting factors to address
Snow/Salmon Watershed Fish and Wildlife Management Plan process	-support the work in-progress and completion, including continuation of land acquisition for conservation and protection -provide assistance in seeking more funding as appropriate.	-loss of channel complexity (LWD, channel condition, loss of side channel, channel instability) -estuarine habitat loss and degradation (diking and road causeways) -poor riparian condition -peak flow Remarks: this SRP is a work in progress resulting from the purchase and acquisition of lands in the lower reaches and subestuaries of Salmon/Snow Creeks
Jefferson County zoning for the Salmon/Snow watersheds	-support continuation of the present zoning for the upper watersheds -monitor long-term effectiveness of the zoning code and enforcement -support Staff on their efforts regarding the core habitats and corridors work including development within channel migration zones -adopt CMZ guidelines as proposed for the CAO update (see section 13- “Jefferson County Programmatic Actions” for more details)	-poor riparian condition -loss of channel complexity (LWD, channel condition, loss of side channel, channel instability)

Tri-Area Stormwater Management Plan	-commitments from the Jefferson County Board of Commissioners to implement provisions of the storrmwater management plan. -consider adoption of a stormwater control to assist in the implementation of the key provisions	-increase in fine sediments -increase in peak flows, freshwater wetland loss, and channel instability Remarks: Jefferson County has adopted the State's "Stormwater Management Manual for Western Washington" as part of their County program (WDOE 2001).
Community Nearshore Restoration Program	-pursue application and implementation of a Community Nearshore Restoration program for Discovery Bay similar to that being conducted in south Hood Canal (see section 13)	-estuarine and nearshore habitat loss and degradation
Agricultural Best Management Practices programs	-pursue voluntary programs similar to that conducted for the Chimacum watershed by the Conservation District and local land-owners	-riparian degradation -Peak flow, freshwater wetland loss, and channel instability Remarks: a similar program to the Chimacum Creek watershed should be explored for the salmon/snow
Salmon Creek Summer Chum Salmon Supplementation Project	-continue with monitoring of the supplementation project to ensure long-term persistence of the stock	-see WDFW and PNPTT (2000) and (2003a) for complete details of this project, also section 5 of this SRP

7.5.2. Projects

Project recovery actions are generally physical modifications to the landscape designed to address specific habitat situations in specific and limited geographic areas. Projects in the summer chum salmon ESU have been in progress for many years by a variety of groups and entities. Section 7.5.2.1 provides an overview of existing projects related to summer chum salmon recovery planning. Many of the project proposals presented in this SRP are from the HCCC Lead Entity strategy (HCCC 2004). This SRP is designed to coordinate with and build on that strategy. Projects presented are categorized according to their benefit for the spawning aggregation of concern (for section 7 of this SRP either the

Jimmycomelately or Salmon/Snow spawning aggregations). All projects that are proposed or recommended in this SRP are strictly voluntary in nature. Those projects that would either take place on, or impact, private property will require the full cooperation and permission from the affected landowners before proceeding. If that landowner permission cannot be obtained, those projects will not proceed.

7.5.2.1. Existing Projects

Figure 7.15 provides a map of existing projects within the lower Jimmycomelately Creek watershed.

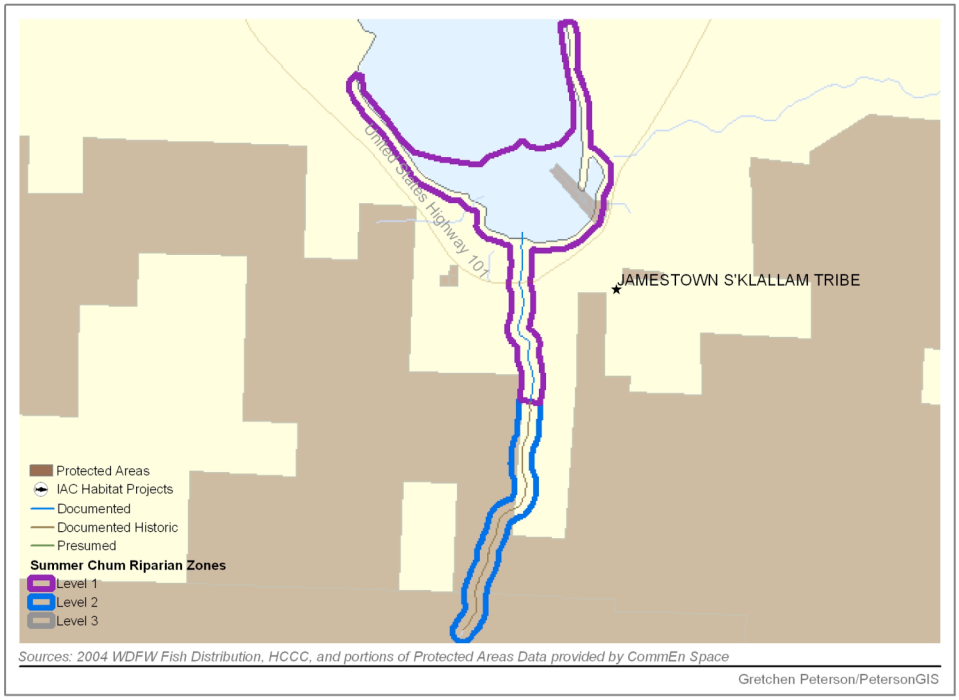

Figure 7.15. Jimmycomelately Creek lower watershed. Shaded areas represent protected lands.

Existing and completed projects for the Dungeness and Jimmycomelately watersheds are described below (project descriptions are derived from IAC Grant Projects at http://www.iac.wa.gov/maps/default.asp and click on the Grant Project Maps link, accessed on June 14, 2005):

99-1657 Dungeness/Jimmycomelately Riparian Land Project Description: Clallam County, the Jamestown S'Klallam Tribe and the Dungeness River Management Team have been working toward restoration of the riparian corridor along the Dungeness River and Jimmycomelately Creek for several years. Estuarine areas at the mouths of both streams have been identified by an interagency work group of fisheries biologists as critical habitat sites. Restoration

activities are precluded by private ownership of several parcels. Flood protection activities by private landowners have severely disrupted the river channels and destroyed habitat for threatened stocks of chinook and summer chum salmon. Land acquisition of key riparian parcels will allow restoration of the river corridors to proceed, especially in the river delta area. At least 55 acres of available riparian property is currently on the market. In the last three years, the North Olympic Land Trust has acquired approximately 80 acres of riparian land and another 150 acres in conservation easements along the Dungeness River. The Tribe and Rainshadow Natural Science Foundation acquired property at the Dungeness Railroad Bridge for development of an Audubon education center. The Tribe and WDFW have also acquired 9 acres of tidelands in Sequim Bay near the mouth of JCL Creek.

00-1045 Jimmycomelately Bridge Project Description:
This is for the construction of an 85' x40' bridge where one does not currently exist, in the historic location of Jimmycomelately Creek. This project is a component of a larger effort to restore the Creek. The lower reach was moved circa 1913, and routed on a terrace to the east. This change in alignment caused the loss of 8 feet of gradient and more than doubled the length of channel in this reach, resulting in a dramatic decrease in the amount of fluvial and tidal energy available to transport sediment in the channel. This energy loss has resulted in severely degraded habitat: * The perched, aggraded stream has lower flows and decreased habitat quality at low flow, which is important to the migratory, spawning, and egg incubation timing of Summer Chum. * The instability of the channel as it progrades into the Bay is so severe that partial or total blockages to fish passage occur at the point at which the Creek enters the Bay. * The Creek no longer has an "estuary", the marine/freshwater transition is abrupt. * Channel instability is chronic, redd scour/fill is severe. The overall project objectives are to restore the Creek to the estuary, restore the estuary by removal of fill and roads, specifically benefiting Summer Chum and waterfowl in the Sequim Bay Watershed, with benefits to other salmon species as well. This project will be implemented by WSDOT, Clallam County is the applicant at the request of the Jimmycomelately Work group.

00-1048 Jimmycomelately Restoration/Acquisition Project Description:
This project will acquire almost six acres of critical salmon habitat at the mouth of Jimmycomelately Creek at Sequim Bay. This effort is a component of a larger protection and restoration program for Jimmycomelately Creek, located in eastern Clallam County. Other funds will support relocating the creek to its historic channel and restoring portions of the estuary. The Creek channel alignment was altered in the early 1900's causing channel aggradation, severe habitat loss, low flows, channel instability, fish passage blockage, scour and fill of redds, and increased flood frequency and severity. Project partners include Clallam County, Clallam Conservation District, WDFW, US Environmental Protection Agency, US Fish & Wildlife Service and others.

Figure 7.16 provides a map of existing projects within the lower Salmon/Snow Creek(s) watershed.

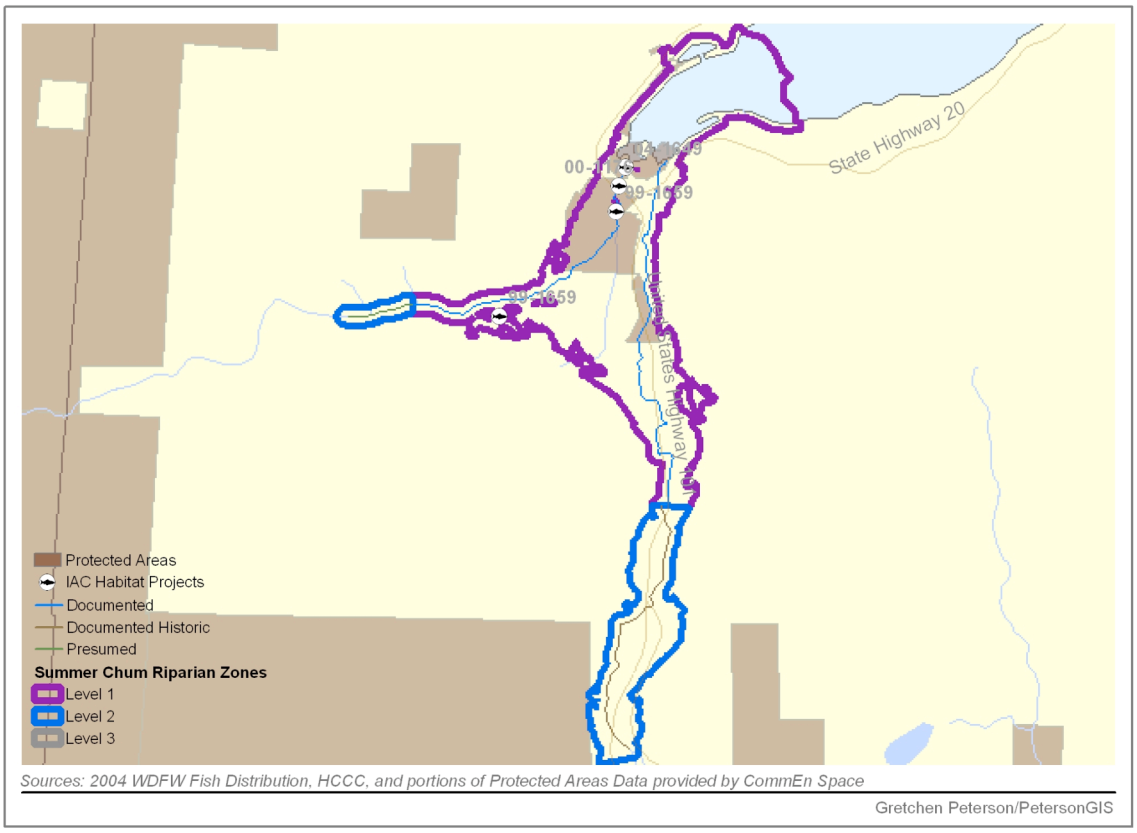

Figure 7.16. Salmon/Snow Creek(s) lower watershed. Shaded areas represent protected lands.

Existing and completed projects for the Salmon/Snow watershed are described below (project descriptions are derived from IAC Grant Projects at http://www.iac.wa.gov/maps/default.asp and click on the Grant Project Maps link, accessed on June 14, 2005):

99-1659 Chimacum and Salmon Creek Project Description:
Salmon and habitat in the Chimacum watershed have decreased dramatically both in quantity and quality in recent decades. The last summer chum was seen in Chimacum Creek in the mid-1980s. In 1992, the status of summer chum salmon in Salmon Creek was reported as critical in the Salmon and Steelhead Stock Inventory (SASSI) report. In response to these declines, Wild Olympic Salmon (WOS), a local non-profit organization, has worked with WDFW and tribal fisheries biologists to operate 2 salmon enhancement hatcheries, one on Salmon Creek and the other on a tributary to Chimacum Creek. The projects have been successful in the building and restoration of summer chum salmon

runs in the respective watersheds and therefore was terminated in 2004 to minimize potential hatchery domestication effects on the populations, consistent with artificial production guidelines in the Summer Chum Salmon Conservation Initiative (WDFW and PNPTT 2000).

00-1176 Salmon Creek Restoration Project Description:
Salmon Creek in Jefferson County is used by a stock of ESA-listed summer chum salmon. Poor habitat conditions limit the sustainability of this stock. This project's objective is to restore natural stream functions and improve salmon habitat in a 2,800-foot reach channelized many years ago for agriculture purposes. Project activities include restoring channel complexity through placing LWD, reducing aggradation, replacing a livestock ford with a bridge, and improving riparian conditions. Other fish species benefiting from this project include coho, cutthroat, steelhead, and sturgeon. Project supporters include private landowners, Wild Olympic Salmon, the North Olympic Salmon Coalition, and WDFW. This project complements the Wild Olympic Salmon/WDFW Salmon Creek/Chimacum Creek Summer Chum Stock Supplementation Project.

01-1346 Salmon and Snow Creek Estuary Project Description:
This is an acquisition and it will protect 4-8 of 33 targeted parcels. It will protect 3+ miles of stream and 300 acres of estuarine and riparian habitat for summer chum, other salmon species and wildlife. This fits with the Hood Canal Coordinating Council's Strategy for Salmon Recovery, which highlights estuary and nearshore habitats as the highest priority for acquisition. Critical habitat acquisition is at the top of the sequenced project lists for both Salmon and Snow Creek.

04-1649 Salmon/Snow Lower Watershed Restoration Project Description:
A partnership between WDFW, Jefferson Conservation District, and North Olympic Salmon Coalition will plant trees on 31 acres of riparian area along Lower Salmon and Snow Creeks and implement multiple estuary restoration projects covering between 5 and 12 acres on acquired land. The project objectives are: 1) Determine the final design for several high priority estuarine restoration actions, 2) Plan for future restoration actions including at least partial removal of railroad grade, 3) Determine the feasibility of reconnecting and restoring lower Salmon and Snow Creeks given historical reference conditions and contemporary constraints, 4) Implement actions including removal of fill from salt marsh and tidal channels, shoreline restoration and revegetation, and removal of abandoned buildings in the nearshore riparian and intertidal zone, 5) Extend riparian planting to 180' on each side of the new Salmon Creek channel, and 6) Extend Snow Creek planted riparian area to 180' from the existing channel. Wider forested riparian areas will address a limiting factor and benefit ESA listed summer chum in both streams, as well as coho, steelhead and cutthroat. Work will be directed by the local Chumsortium, a local restoration

consortium, and administered by the North Olympic Salmon Coalition as Phase IV of a decade of on-going recovery efforts.

Figure 7.17 provides a map of existing projects within the lower Chimacum Creek watershed.

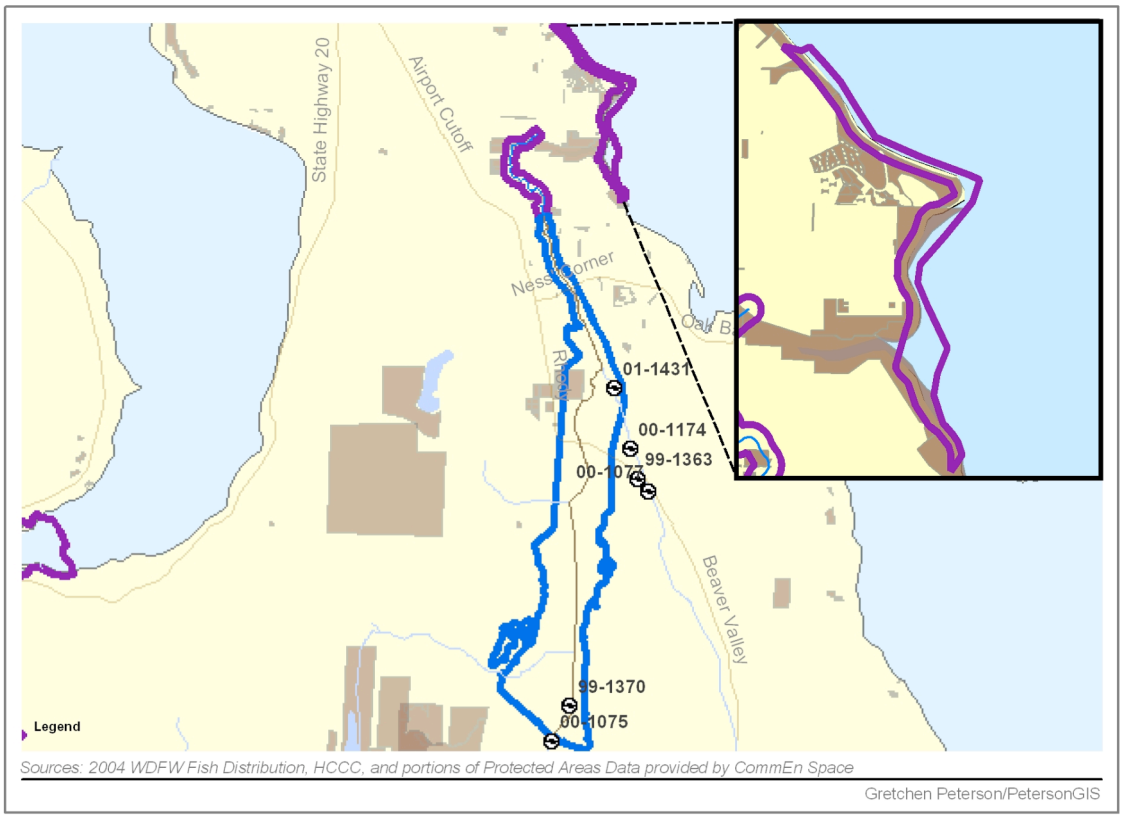

Figure 7.17. Chimacum Creek lower watershed. Shaded areas represent protected lands.

Existing and completed projects for the Chimacum watershed are described below (project descriptions are derived from IAC Grant Projects at http://www.iac.wa.gov/maps/default.asp and click on the Grant Project Maps link, accessed on June 14, 2005):

99-1370 Christian Property Chimacum Creek Habitat Project Description: Enhancement on the Christian property on Chimacum Creek will reconfigure an additional 250' with 50' riparian buffer adjacent to the 1998 reconfiguration of 650 ft. by the Department of Natural Resources. The area was channelized for agricultural purposes decades ago. Large amounts of Large Woody Debris will be added to the stream and forested riparian buffers replanted. Over 250 feet of channel will be excavated to create a flood plain bench 8-10 feet wide and then pulled back upslope to a 2:1 bank slope. Approximately every 65 feet, a scallop

in the shoreline will be constructed, with a log structure to create a pool, with the addition of LWD to create complexity and habitat. Large rock will be placed in/around spawning areas/riffles to improve fish habitat. The cut slope bench will be extensively planted with native shrubs with the area above the flood plain being planted with conifers. This project is a planned and permitted extension of the 1998 project providing additional complexity, improvements for summer and winter rearing for juvenile coho and cutthroat and enhanced spawning habitat for coho and steelhead. Plantings of trees and shrubs will help bring the summer water temperatures down in Chimacum Creek and provide cover and food sources. Spawning activity, species use and water quality will be monitored through local partnerships.

00-1075 West Fork Chimacum Creek Restoration Project Description:
This project reconfigured and naturalized a half-mile of ditched stream channel on Chimacum Creek, near Port Townsend. The project objective is long term improvement of overall stream conditions in the watershed, reducing sedimentation, increasing dissolved oxygen, and reducing nutrient loading. These improvements will assist summer chum spawning downstream while improving rearing and spawning habitat for coho, cutthroat and steelhead. Project elements include replacing a culvert with an inexpensive bridge; revegetating 15 acres of riparian zone to provide shade cover; and control of invasive weeds. The project will also excavate the stream bank; emplace LWD to create pools and riffles, deflect current and create back eddies; and create side channels to establish natural flow dynamics. Project partners include the Jefferson County Conservation District, Wild Olympic Salmon, Trout Unlimited and Chimacum Schools.

00-1077 East Chimacum Creek RM 1.2-2.3 Project Description:
This project will improve salmon habitat and water quality in a low-gradient, channelized, agricultural reach of East Chimacum Creek. This reach has very low dissolved oxygen levels during summer due to clogging with reed canary grass. In addition the riparian zone has little functional vegetation. Project elements include: removing reed canary grass from the channel, re-meandering the channel where possible, excavating bank margin pools, anchoring LWD in the pools and channel, and planting native trees and shrubs in the riparian zone. The Conservation District will also install livestock exclusion fencing and off-stream livestock watering systems. Anticipated outcomes are higher dissolved oxygen levels; lower fecal coliform and stream temperature levels; and improved channel structure, fish habitat and riparian function. This project will benefit coho, steelhead, cutthroat, and summer chum. Project partners include private landowners, Wild Olympic Salmon, and North Olympic Salmon Coalition.

00-1174 Lower East Fork Chimacum Creek Project Description:
This project will restore habitat in the Lower East Fork of Chimacum Creek. Project elements include reconfiguring and naturalizing 1,600 feet of ditched

stream channel and planting native riparian vegetation to establish shade cover and control invasive weeds on four acres of riparian buffer. This project complements previous restoration work on the Creek. The project will also excavate the stream bank and place large woody debris to create pools and riffles and help the channel establish a more natural flow dynamic. Other project elements include livestock exclusion fencing on both sides of the Creek. The project will reduce sedimentation, increase dissolved oxygen, and reduce nutrient loading that affects egg survival of summer chum. The project also improves rearing and spawning habitat for coho, cutthroat and steelhead. Project partners include the Jefferson County Conservation District, Wild Olympic Salmon, Trout Unlimited, and Chimacum Schools.

7.5.2.2. Project Proposals for the Jimmycomelately Spawning Aggregation

To most effectively address those factors that are likely affecting the performance of the Jimmycomelately spawning aggregation the SRP recommends the following projects. All projects that are proposed or recommended in this SRP are strictly voluntary in nature. Those projects that would either take place on, or impact, private property will require the full cooperation and permission from the affected landowners before proceeding. If that landowner permission cannot be obtained, those projects will not proceed. Estimated costs for these projects are presented in Appendix D.

Table 7.13. SRP recommended projects for the Jimmycomelately spawning aggregation.

Recommended Projects/Actions	Tasks involved, sub-actions, barriers to implementation	Limiting factors to address
Jimmycomelately Creek-Lower Sequim Bay Estuary Restoration Project	-work in progress (for a summary of this project see the brochure "The 'Undevelopment' of Jimmycomelately Creek and Estuary" written by Linda Newberry and produced by the Jamestown S'Klallam Tribe 2003)	-lack of channel complexity (LWD, channel condition, loss of side channel, channel instability) -sediment aggradation -estuarine habitat loss and degradation (diking, filling, log storage, road causeways)

7.5.2.3. Project Recommendations for the Salmon/Snow Spawning Aggregation

To most effectively address those factors that are likely affecting the performance of the Salmon/Snow spawning aggregation (and in this case, also including Chimacum Creek) the SRP recommends the following projects. All projects that are proposed or recommended in this SRP are strictly voluntary in nature. Those projects that would either take place on, or impact, private property will require

the full cooperation and permission from the affected landowners before proceeding. If that landowner permission cannot be obtained, those projects will not proceed.

Table 7.14. SRP recommended projects for the Salmon/Snow spawning aggregation. Presented in two subtables: Salmon/Snow Creek and Chimacum Creek

Salmon/Snow Creek

Recommended Projects/Actions	Tasks involved, sub-actions, barriers to implementation	Limiting factors to address
Remove railroad grade, fill, and levees along estuary to restore salt marsh and tide flats	-a barrier to implementation is a water line and easement issue. One approach would be to vacate water line, put in well or move line around the perimeter area -need to focus on removing grade levee, fill, including the railroad causeway and creosote armoring	-estuarine habitat loss and degradation (diking and road causeways)
Remove part of the railroad grade to open up a salt marsh to tidal action for better access for fish	-would need to discuss feasibility of this project with private landowners -Olympic Discovery Trail public access -remove the RR grade	-estuarine habitat loss and degradation (diking and road causeways)
Remove railroad grade and road fill between ponds to open up tidal flow	-removing the grade/dirt -remove 3 overwater old sawmill structures	-estuarine habitat loss and degradation (diking and road causeways)
Control exotic vegetation	-clear and grub approximately 2 acres around the Snow Cr estuary	-poor riparian condition
Reconnect Snow Creek back into Salmon Creek above hwy 101.	-would need to discuss feasibility of this project with private landowners (agricultural businesses) located above Hwy 101	-increased sedimentation (fines, aggradation) -lack of channel complexity (LWD, channel condition, loss of side channel, channel instability) -Peak flow and low summer flows

Evaluate and abate effects of U.S. Highway 101 causeway to allow reconnection of floodplain	-could be a similar project to the Jimmycomelately restoration project	-estuarine habitat loss and degradation (diking and road causeways)
Restore sinuosity and natural channel configuration in artificially-confined reaches by removing riprap, road crossings, and ditching	-would need to discuss feasibility of this project with private landowners (agricultural business) -possibilities include riparian planting, soft armoring, buyout of house and land, place LWD structures	-loss of channel complexity (LWD, channel condition, loss of side channel, channel instability)
Plant and maintain riparian areas on both public and private properties	-restore diversity quality and quantity on approximately 3.5 miles of Snow Creek and 1 mile of Salmon Creek	-poor riparian condition
Continue livestock exclusion fencing where appropriate	-Investigate possibility of implementing BMP similar to approach used for Chimacum Creek	-poor riparian condition -increased sedimentation (fines, aggradation)
Fee-simple purchase or conservation easement of: 1) remaining estuary parcels, 2) mainstem floodplain, and 3) sediment source abatement in parcels downstream of federal lands	-work with the Snow/Salmon Watershed Fish and Wildlife Management Plan proponents	-estuarine habitat loss and degradation (diking and road causeways) -increased sedimentation (fines, aggradation)
Decommission USFS roads	-assess sediment from other USFS roads -abating the sediment loading from the roads	-increased sedimentation (fines, aggradation)

Chimacum Creek

Recommended Projects/Actions	Tasks involved, sub-actions, barriers to implementation	Limiting factors to address
Fee-simple purchase or conservation easement of: 1) remaining estuary parcels, 2) mainstem floodplain, and 3) sediment source abatement in parcels downstream of federal lands.	-work with landowners to determine feasibility of acquisition, purchase and easements	-estuarine habitat loss -increases in fine sediments